Devoted to
TEXTILE
CHEMISTRY
BLEACHING
DYEING
PRINTING
FINISHING

AMERICAN DYESTUFF REPORTER

FEBRUARY 23, 1948
VOLUME 37, No. 4

OFFICIAL PUBLICATION
of the
PROCEEDINGS
AMERICAN ASSOCIATION
OF TEXTILE CHEMISTS
AND COLORISTS

Put it in print with VAT COLORS

Du Pont vat color pastes for printing cottons and rayons—PONSOL* and LEUCOSOL* colors (anthraquinone-type dyes)...SULFANTHRENE* colors (thioindigoid-type dyes).

The physical properties of these products are especially controlled to yield a full range of shades in printing. They offer the best all-round fastness obtainable... help assure customer satisfaction. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Div., Wilmington 98, Del.

*Reg. U. S. Pat. Off.

Du Pont Dyestuffs

DU PONT
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BETTER THINGS FOR BETTER LIVING... *THROUGH CHEMISTRY*

ZAPPRATEX 120

ANIONIC SUBSTANTIVE SOFTENER FOR CELLULOSIC FABRICS

- Will not oxidize on fabric to cause discoloration or rancidity
- May be exhausted onto cellulosic fabrics from a dilute solution
- Finish shows high degree of resistance to laundering
- Compatible with other anionic finishes and with alkaline materials
- Will not discolor white goods or develop undesirable odors after ageing and pressing
- Has no adverse effect on light-fastness of dyes
- Soluble in warm or hot water

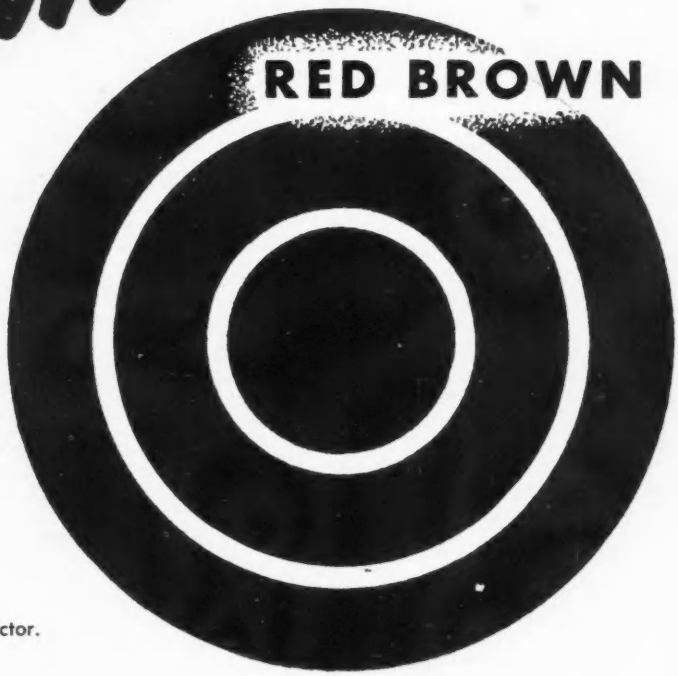
Warwick Technical advisors, with their wide knowledge of textile chemicals and processes, are available for consultation.

WARWICK CHEMICAL COMPANY — Division of SUN CHEMICAL CORP. 330 Fifth Avenue, New York 19, N.Y.

AMANTHRENE* VAT COLORS
provide the answer to the demand for
better color fastness in textiles

Amanthrene

RED BROWN



in double paste or
double powder form

An excellent base color for deep chocolate browns and a shading element for taupes and tans where fastness to light, washing, chlorine and perspiration is a factor.

Satisfactorily meets the requirements for slip cover materials, upholstery fabrics, sports wear, and men's work clothes.

Suitable for cotton and rayon yarn in warp, beam and package dyeing equipment, as well as for skein work and hosiery. Well adapted, also, to jig and pad-jig dyeing of piece goods.

Another of the Amanthrene range of superior vat colors. For detailed information on the whole range available, as well as data regarding your own particular requirements, consult our nearest branch. A.A.P. technicians are always happy to be of service.

AMERICAN ANILINE PRODUCTS, INC., 50 Union Square, New York, N. Y. • ***Plant:*** Lock Haven, Pa.
Branches: Boston, Mass. • Providence, R. I. • Philadelphia, Pa. • Charlotte, N. C. • Chicago, Ill. • Los Angeles, Cal.
Chattanooga, Tenn. • **Dominion Anilines & Chemicals Ltd.** • Toronto, Canada • Montreal, Canada

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IF YOU WANT

DURABLE *Softness*

Paramine TA is the modern cationic finish for acetate, viscose, cotton and mixed fibres. Mills using paramine TA for dress goods, glove fabrics, tricot and other types of knitted materials have found this finish offers added sales appeal.

Thorough penetration of Paramine TA assures a softness within the yarn itself that gives materials a full hand and desirable drape — its substantive action produces a durable, lasting finish — Application is simple.

Use Paramine TA

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WRITE FOR DETAILS OR DEMONSTRATION

Arkansas Co. INC.

Manufacturers of Industrial Chemicals for Over 40 Years

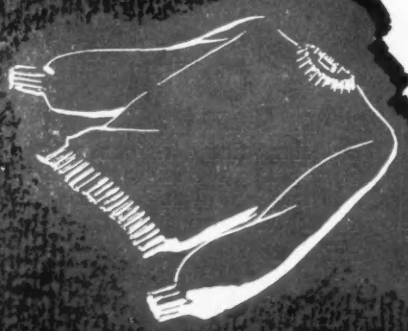
NEWARK, NEW JERSEY

American Dyestuff Reporter, Vol. 37, No. 4, February 23, 1948. Published every other Monday. Copyright, 1948, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00; Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y. Post Office, under the act of March 3, 1879.

DYERS, TOO, HAVE THEIR "FAVORITE COLOR"

Calcocid Alizarine Blue SAPG

- a brighter blue
- produces better shades
- imparts clearer tones



WHEN, before the war, we introduced our Calcocid Alizarine Blue SAPG to the trade, its outstanding performance surpassed all other Alizarine Saphirol Blues.

Today, Calcocid Alizarine Blue SAPG is still the best—because it is the brightest and greenest product of this type on the market.

Calcocid Alizarine Blue SAPG, the brightest and greenest of blues, is recommended for woolens and worsteds, knitting yarns, carpets, upholstery fabrics, hat felts and wherever light fastness is essential.

Application is by the usual method employed for wool dyeing with sulfuric acid dyeing colors.

Write now to Calco for additional information.

CALCO CHEMICAL DIVISION
AMERICAN CYANAMID COMPANY
Bound Brook, New Jersey

New York • Chicago • Philadelphia • Boston • Charlotte • Providence

Calco
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FOR YOUR INFORMATION

STYMER NOW IN NEW CONVENIENT FORM

Those who have already learned the advantages of Monsanto's Stymer in improving acetate sizing will welcome this month's news . . . Stymer is *now available in sodium salt form*. This new formulation, is soluble in water, eliminates the pH control problem and eliminates the use of sodium hydroxide in your plant.

All other advantages of Stymer for acetate sizing are retained:

- New toughness at high humidity
- New flexibility at low temperature
- Minimum static in slashing and weaving
- Sticking to dry cans eliminated
- Shedding minimized
- No gelling when cold, no setting up in pipes
- Broken filaments in warp picked up
- May be applied from size bath at any temperature 130° to 160° F.
- Easily washed out when necessary

For more information about Stymer in sodium salt form, mark item B-1 in the coupon opposite.

Wrinkl-Shed Cotton

Wrinkl-Shed cotton developed by Dan River Mills with Monsanto's Resloom* Formula C for Wrinkle-Resistant Cotton is now being announced to the consumer in a nation-wide promotion in all leading fashion magazines. Wrinkl-Shed cotton has been developed first in cotton tweeds for resort clothes by Carolyn Schnurer, famous designer. The garments are on sale in 45 Peck & Peck stores in the East and Middle West, and by Jos. Magnin stores on the Pacific Coast. Dan River is expected shortly to present Wrinkl-Shed cottons in ginghams, corded chambray, etc. If you would like to see copies of Monsanto's announcement of its participation with Dan River in the Wrinkl-Shed cotton promotion, use the coupon below. Check Item B-3.

Patterns on Pile Fabric Obtained with RESLOOM and STYMER

By roller printing Resloom and Stymer on a pile fabric, curing and then acid dyeing, we have recently created some extraordinarily beautiful upholstery materials. Because the dyes affect the treated and untreated portions of the fabric unequally, a distinctive, sharp, two-tone effect is gained. The fabric was a wool acetate blend. The hand remained soft and pliable.

For more details about this application check item B-4 on the coupon.

FOR THE TOUGHEST CLEANING JOBS: STED, A NEW DETERGENT

STED is a powerful, new, detergent for efficient industrial scouring. Effective on all types of fibers in practically every washing operation, Sted was developed to solve the toughest textile problems in scouring, washing and cleansing. Strongly recommended for raw wool scouring, Sted also is desirable for backwashing, desizing, kier boiling, hosiery scouring, printed and dyed goods soaping. Superior performance, ease of operation and low cost make Sted a leading economical detergent for large-scale textile washing.

Sted is chemically mild and non-sudsing; yet its cleaning power has been established in practical field tests and in laboratory evaluation under mill conditions. These tests have proved that foam is not necessary for good detergency.

The new product not only removes soil but holds it in suspension to prevent redeposits on the fiber. It is stable to acid or alkali, soluble in hard or soft water. Sted rinses quickly, easily and thoroughly without the formation of foamy scums and the development of odors common with fatty acid derivatives.

So mild it won't damage the most delicate fiber, Sted's non-ionic nature, high potency, non-substantivity and moderate pH values make it particularly effective in wool scouring. Very low grease retention is obtained and the wool is loftier, more open and brighter. No oily film is deposited on the wool as with substantive detergents and bath strengths are not greatly lowered. For full information check B-2 in the coupon.

Tests Prove Washable Wools Are Here

Independent tests conducted for wool shrinkage in men's shirts treated with Resloom W, showed the following results, after five launderings *in an automatic washer:*

Collar	0.8%
Shoulder Gusset	0.0%
Right sleeve	0.4%
Front length	2.7%
Back width	1.0%
Back length	2.5%

This means no change in marked size; there was no change in color, no felting, no stiffening of the "hand." The cycle; two five minute suds at 100° F. neutral soap and four two minute rinses.

The shirts Bloch-Heller's "Game & Lake" brand made from North Star's "Nocturne" fabric used for this test were bought over the counter at Filene's, Boston, and turned over direct to an independent laboratory.

For more information on washable wools check B-5 in the coupon. Resloom, Stymer ®

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CHEMICALS — PLASTICS
SERVING INDUSTRY . . . WHICH SERVES MANKIND

USE THIS COUPON TO BRING YOU PROMPTLY FULL INFORMATION ON MONSANTO TEXTILE CHEMICALS

Monsanto Chemical Company
Textile Chemicals Dept.
Department ADT-2
140 Federal St.,
Boston 10, Mass.

Please send me information on the following:

B-1, B-2, B-3, B-4, B-5.

Name..... Title.....

Company.....

Address.....

City..... State.....

The FINISH is the Payoff!

In the race for sales, too, the finish is everything. Hosiery . . . and other textile products . . . must have that thoroughbred appearance to be "in the money."

For specialized chemicals—water repellents, mildew-proofings, etc.—as well as standard oils or finishing materials, you'll find that FANCOURT quality and personalized attention to your problems will help you take—and keep—the lead.

Try Resin B and Nyatex for beautifully finished nylons. Reduce handling damage; add sales appeal

W. F. FANCOURT & CO.

PHILADELPHIA, PA.

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Solving Finishing Problems Since 1904

IGEPALS

outstanding non-ionic surface active agents for wool, cotton and synthetic fibers.

- Excellent wetting, emulsifying and scouring properties
- Quick rinsing
- Readily soluble at all temperatures
- Equally effective in hard or soft water
- Neutral reaction
- Resistant to acids and alkalis
- Non-electrolyte—non-reactive
- Compatible with anionic and cationic compounds

Our skilled technicians are available for plant demonstrations.

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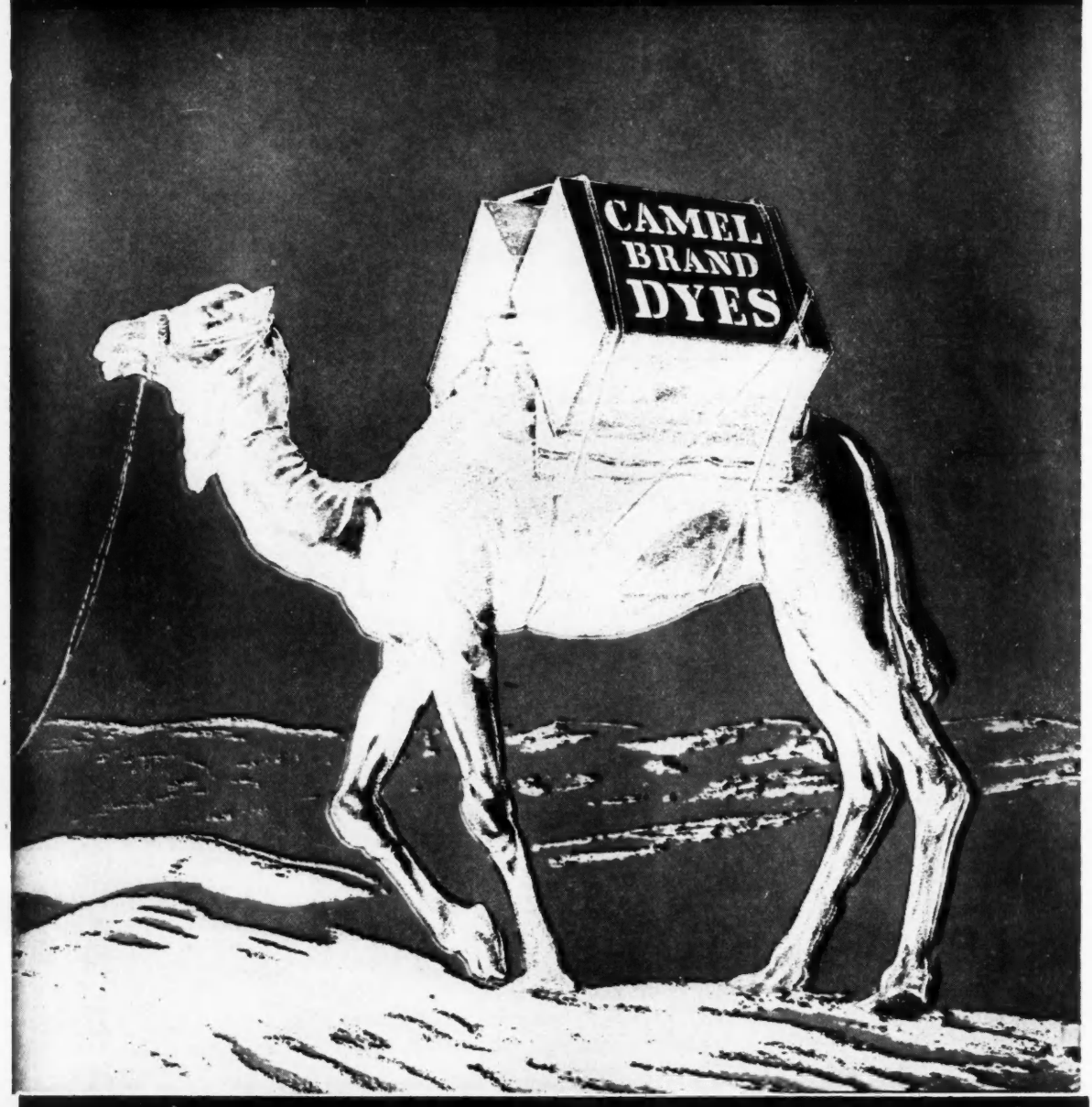
SINCE 1878



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BOSTON EAST CLEVELAND, OHIO ATLANTA, GA.

Flotex FOR PRINTING

for extremely sharp outlines

FLOTEX adds sharpness of detail and brilliance of color to the *now* look—before it is fashioned from wool, cotton and rayon.

FLOTEX remains stable in the presence of acids and alkalies. It excels in printing Rapidogen, Indigosol, Napthol, Chrome, Acid and Basic colors on all types of fabrics. It also yields jet blacks with extremely sharp outlines.

FLOTEX is a colorless, clear-cooking thickener that serves as a replacement or extender for considerably more expensive Tragacanth, Locust Bean and other natural and synthetic gums for either roller machine or screen printing. It produces a high viscosity with low solids . . . deposits only a thin film on the cloth . . . and leaves the printed portion of even the sheerest of fabrics soft and pliable.

National also produces: **FIBERTEX** for finishing sheer cotton, rayon crepes and spun rayon blends; **AMBERTEX** a heavy-bodied thickener for white discharge and vat color printing; **VAT THICKENER 36** for vat colors on cotton and rayon; **TABLE ADHESIVE** for screen printing; **FLOCK ADHESIVE 970** for chenille flock printing.

Offices: 270 Madison Avenue, New York 16; Boston, Philadelphia, Atlanta, New Orleans, Indianapolis, Chicago, San Francisco and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto, Vancouver and Montreal. In Holland: Nationale Zetmeelindustrie, N. V., Veendam.

Photo Courtesy of INTERNATIONAL WOOL SECRETARIAT

National
STARCH PRODUCTS

STARCHES — AND SPECIALTIES WITH EASILY DEMONSTRATED SUPERIORITY

ATLANTIC PETROLEUM CHEMICALS

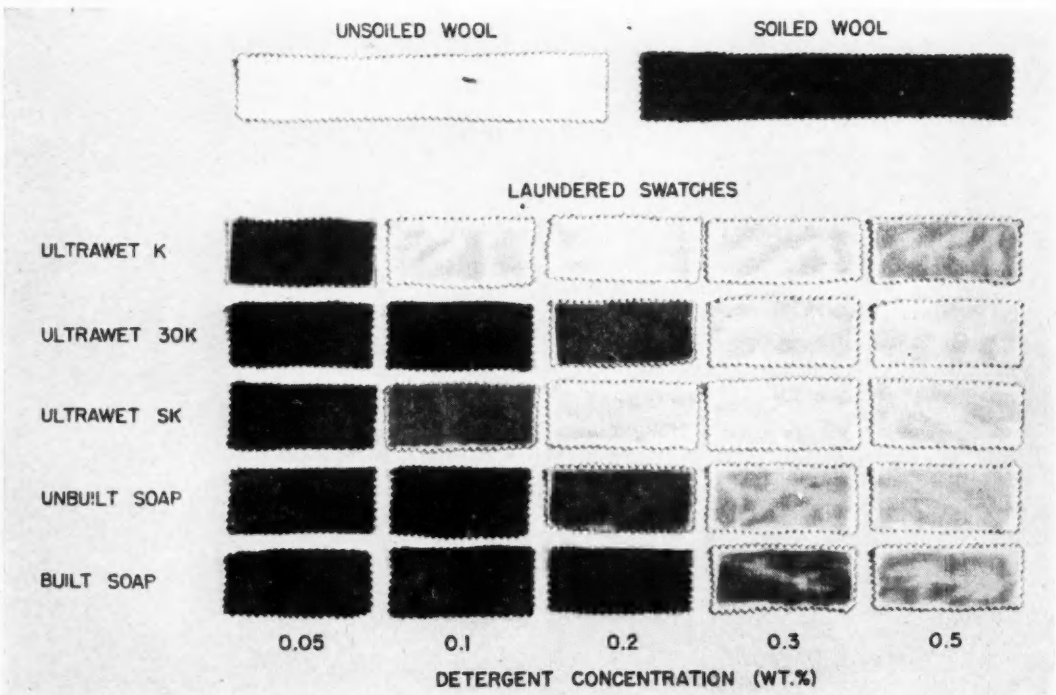
ULTRAWET K's

Atlantic's new K series Ultrawets are among the finest alkyl aryl surface-active agents yet offered. Their superior wetting, sudsing and detergent properties recommend them for better soaps, cleaning compounds, cosmetics and many industrial processes.

Ultrawet K's are available now in quantity for immediate delivery in liquid, flake or bead form. As a liquid, they are pale amber in color, odorless (no kerosene or sludge odor) and uniform. In flake and bead form they are the detergent compounder's ideal product from the standpoint of whiteness and lack of color.

The new Ultrawet K's are the product of 10 years' research by Atlantic, for over three-quarters of a century a leading maker of quality petroleum products. The outstanding properties of the K series are indicated by the following data:

Physical Form:	*Ultrawet K Flakes*	*Ultrawet 30K Liquid*	*Ultrawet SK Beads*
Wt. % Active Sulfonate—min.	85	25.5	35
pH—1% Solution:	7-8	7-8	7-8



Picture shows superior wool detergency of Ultrawet K's over built and unbuilt soaps. Wool swatches impregnated with a synthetic soil are washed in a standard laundrometer. The wash solution consists of stated concentrations of detergents and water with a hardness of 100 p.p.m. Tests are conducted for 20 minutes at 105° F. and followed by 2 rinses.

Surface Tension:	*Ultrawet K*	*Ultrawet 30K*	*Ultrawet SK*
Concentration @ .001 wt. %	48.0 dynes/cm.	64.4 dynes/cm.	58.8 dynes/cm.
@ .005 wt. %	34.8 "	41.1 "	42.0 "
@ .01 wt. %	29.0 "	33.4 "	32.9 "
@ .05 wt. %	27.3 "	28.2 "	27.9 "
@ .10 wt. %	26.7 "	27.4 "	27.1 "
@ .50 wt. %	27.0 "	26.9 "	26.8 "

Draves Wetting Times Test:			
Concentration @ .05 wt. %	35 sec.	—	300 sec.
@ .10 wt. %	8.2 "	265 sec.	35 "
@ .20 wt. %	4.0 "	21 "	11.6 "
@ .50 wt. %	2.6 "	5.8 "	4.4 "

Ross-Miles Foam Test:			
Concentration @ .05 wt. %	116 mm.	89 mm.	98 mm.
@ .10 wt. %	132 "	105 "	121 "
@ .20 wt. %	148 "	127 "	136 "
@ .50 wt. %	161 "	142 "	154 "

(*Note:* Surface Tension, Draves Wetting Test and Ross-Miles Foam Test are conducted at 75° F. and Ultrawet K's solutions were made up using water with a hardness of 100 p.p.m. Draves Wetting Test run with 1.5 g. hook.)

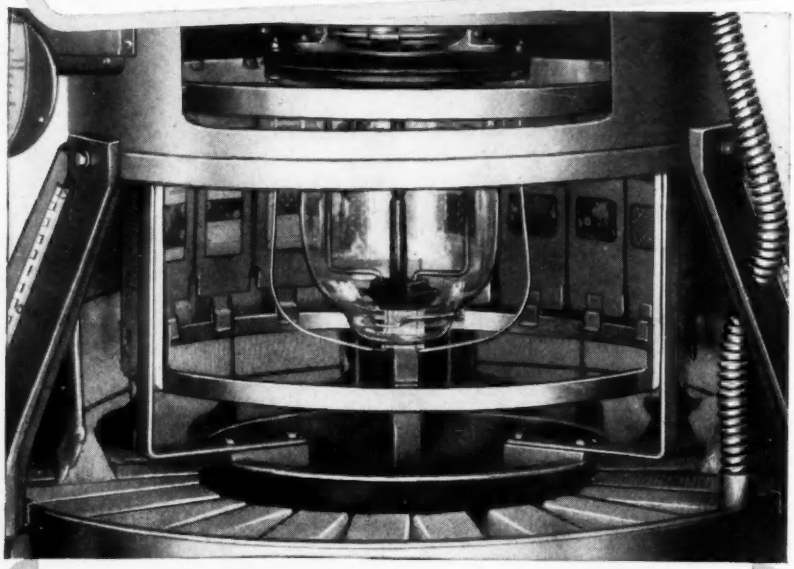
For samples, further information and quotations, contact

THE ATLANTIC REFINING COMPANY
CHEMICAL PRODUCTS DIVISION
260 SOUTH BROAD STREET
PHILADELPHIA 1, PA.

ATLAS FADE-OMETERS

Now have an improved method of specimen suspension assuring a more equal distribution of radiant energy for all samples.

Available for installation on all Model FDA and FDA-R Fade-Ometers now in use. . . . . . .



A lower ring engaging the new modified specimen holders supports the specimens during exposure in such a way as to assure a more equal distribution of energy for all samples.

Developed at the request of and in cooperation with the A.A.T.C.C. Committee on Fastness to Light the new holders and lower ring prevent discrepancies in test results caused by unequal distances from the specimen to the light source resulting from improper alignment of the holders.

This new method of suspension improves accuracy of test results since it materially reduces the possibility of deviation of the specimens from the vertical due to the human element or for mechanical reasons.

The lower ring can be installed on all Model FDA and FDA-R Fade-Ometers now in operation, adapting them for use with the new type specimen holders. In addition to the holders finished in baked-on gray enamel we now are also able to supply at slight additional cost the new modified specimen holders fabricated from a dull finish stainless steel.

Write for complete information on this new improved method of specimen suspension for your old machines.

ATLAS ELECTRIC DEVICES CO.

361 W. Superior Street, Chicago 10, Illinois

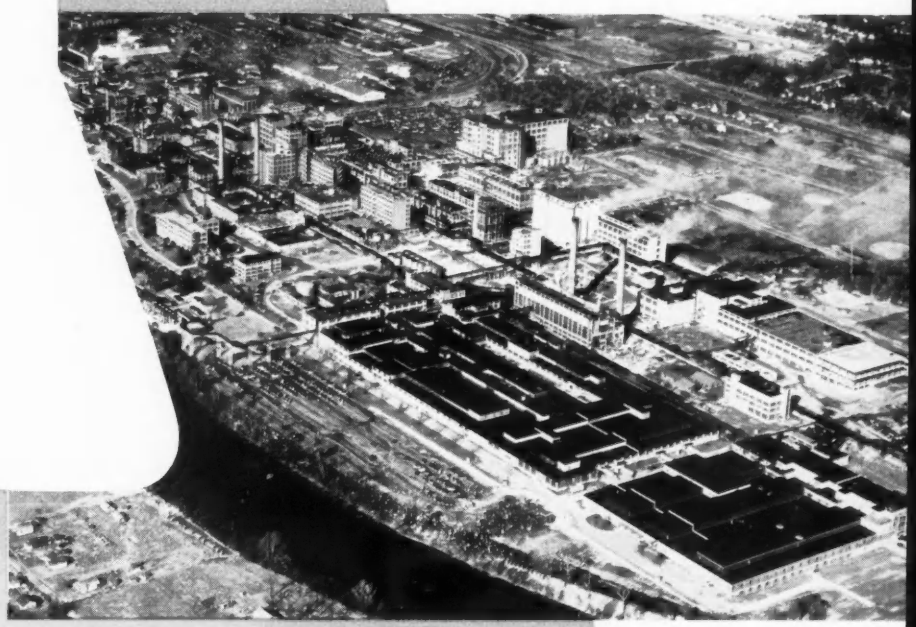
Originators and sole manufacturers of Fading, Weathering and Laundering testing machines for over a quarter of a century.

SALES REPRESENTATIVES IN PRINCIPAL CITIES ALL OVER THE WORLD

FADE-OMETERS • WEATHER-OMETERS • LAUNDER-OMETERS

Eastman Acetate Dyestuffs

A wide variety of colors is available in Eastman Acetate Dyestuffs, especially developed for the dyeing of synthetic fibers by scientists who have had long experience in the production of colors for cellulose products. Eastman Acetate Dyestuffs are manufactured under strict laboratory control in a modern plant to assure dyers of uniformly high-quality dyes. The full benefit of Eastman research on dyeing problems is extended without obligation to users of these dyestuffs.



Eastman Acetate Dyestuffs are sold in the United States through Tennessee Eastman Corporation in Kingsport, Tennessee, and Lodi, N. J.; in Canada, through Clough Dyestuff Company Ltd., 33 St. Mathieu Street, St. Laurent, Quebec.

Tennessee Eastman Corporation

—A SUBSIDIARY OF EASTMAN KODAK COMPANY

For Uniformity in Fabric Quality Use Hooker Uniform Quality Chemicals

YOUR PRODUCTS of tomorrow depend upon your raw materials of today. To insure maintenance of your own high quality, you can standardize your processes by using Hooker Chemicals. In this way you will be assured of avoiding costly adjustments in your operations.

Occasional changes in analysis of Hooker Chemicals mean improvements in quality and better adaptability to your processes. One such improvement is the recent change in the iron content of Hooker Sodium Sulfide from 15 ppm to 8 ppm. Our strict control of quality is your assurance of uniform, high quality fabrics.

From the many Hooker products used in the Textile Industry, a few are briefly described below. More information in the form of Technical Data Sheets is available when requested on your business letterhead. Hooker's Technical Staff will also help you on problems involving Hooker Chemicals in your particular operations.

PRODUCT *Chemical Formula; Molecular Weight*	HOOKER SPECIFICATIONS		SUGGESTED USES
Aluminum Chloride, Anhydrous $AlCl_3$: 133.3	Aluminum Chloride Iron	98.5% Min. 0.05% Max.	Catalyst in synthesis of dyestuffs and intermediates.
Antimony Trichloride, Anhydrous $SbCl_3$: 228.1	Antimony Trichloride Iron and Arsenic Lead	99% Min. 1% Max. 0%	Catalyst in organic synthesis; mordant in textile printing. Moisture and fire-proofing textile.
Benzoic Acid C_6H_5COOH: 122.1	Benzoic Acid	99.3% Min.	Manufacture of dyes. Mordant.
Benzoate Soda, Tech. C_6H_5COONa: 144.0	Benzoate of Soda	99% Min.	Preservative in sizes.
CP-40 (42% Chlorinated Paraffin) $C_{26}H_{46.5}Cl_{7.5}$: 625	Chlorine Content Viscosity at 210°F Acidity as HCl Color, Union Colorimeter, ASTM Thermal Stability	42.5% 160 to 180 SUS 0.006% Max. 1.5 to 2.5 0.15% HCl Max.	Water-proofing and fire-proofing textiles.
CP-70 (72% Chlorinated Paraffin) $C_{21}H_{29}Cl_{21}$: 1063	Chlorine Content Iron Acid Number, mg KOH/gm Softening Range	68 to 72% .01% Max. 0.50 Max. 90 to 100°C	Water-proofing and fire-proofing textiles.
Lauryl Pyridinium Chloride $C_5H_5N(C_{12.6}H_{26.2})Cl$: 292	Semi-crystalline solid (active ingredient)	85% Min.	Cationic surface-active agent for textile processing and germicidal specialties.
Sodium Sulfhydrate NaSH: 56.1	NaSH Na_2S NaCl Na_2SO_3, $NaHCO_3$ Fe Cu, Ni, Cr, Mn, Pb Water of crystallization	70 to 72% 0.25 to 2.5% 0.4 to 0.8% 0.04 to 0.4% 5 ppm. Max. 1 ppm. Max. 28 to 26%	Desulfurizing rayon; calico printing; in sulfur dye baths.
Sodium Sulfide Na_2S: 78.1	Na_2S NaCl Other Na Salts Fe Cu, Ni, Cr, Mn, Pb Water of crystallization	60 to 62% 1.5% Max. 2.0% Max. 8 ppm. Max. 1 ppm. Max. 36.5 to 34.5%	Desulfurizing rayon; calico printing; in sulfur dye baths.

HOOKER ELECTROCHEMICAL COMPANY

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HOOKER CHEMICALS

Chlorine Muriatic Acid Caustic Soda Paradichlorbenzene

For Wool Scouring...

MAPROFIX PASTE is Better than Soap!

Maprofix Paste is not just a substitute for soap or an additive for soap solutions in wool scouring. It is one of the most potent of all scouring materials, giving definitely superior results on raw wool, wool skeins, wool and worsted piece goods, etc.

MAPROFIX PASTE

- **Has superior emulsifying and detergent action.**
- **Leaves wool in exceptionally firm, resilient and full bodied condition.**
- **Rinses out faster and better than soap.**
- **Costs materially less to use than high quality soaps.**

Maprofix Paste is a sodium salt of a sulfated fatty alcohol mixture, compatible with hard water, acids and alkalies, and completely stable to heat, as well as in storage.

It is also used for scouring tubular knit goods, acetate and rayon yarns and piece goods, rayon hosiery, print washing and many other emulsifying, detergent and wetting out processes.

If you have never tried Maprofix Paste for wool scouring, write for a big enough sample to check the claims we make above!

ONYX OIL & CHEMICAL COMPANY

JERSEY CITY 2, N. J.

CHICAGO • PROVIDENCE • CHARLOTTE • ATLANTA • LOS ANGELES

In Canada: Onyx Oil & Chemical Co., Ltd., Montreal, Toronto, St. Johns, Que.
For Export: Onyx International, Jersey City 2, N. J.

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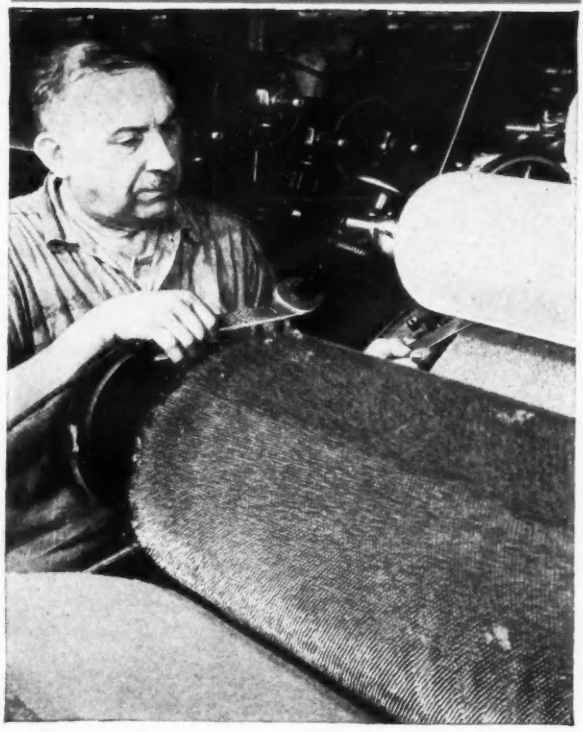
CHEMICALS FOR WOOL PROCESSING

Next to Her Skin . . .

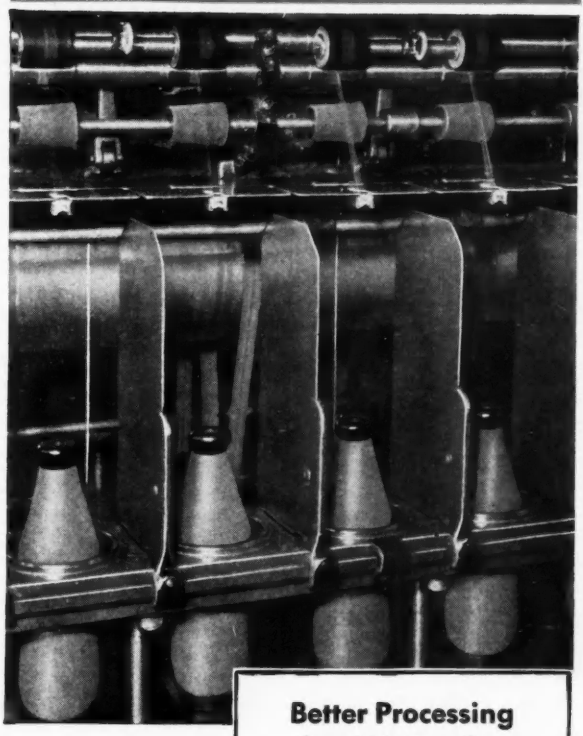
The most beautiful *finishes on fabrics* are acquired by the consistent use of Watson-Park products.

WATSON-PARK CO.
261 FRANKLIN ST., BOSTON, MASS.
FACTORY — LOWELL JUNCTION, MASSACHUSETTS

Longer Runs on the cards . . .



Stronger Yarns on the frames



S/V WOOLREX OILS

penetrate uniformly into the stock, scour out easily

For all around superior results, try S/V Woolrex Oils in your wool processing. From the time they're sprayed onto your stock until they're scoured out, they will give you many advantages.

For instance, in carding, you will get longer runs before stripping is necessary. S/V Woolrex Oils are free from gum-forming tendencies.

During your spinning operations, these superior oils will keep the fibers soft and pliable. Your rovings will draw out evenly without breaking.

Finally, and vitally important, these oils will scour out easily in conventional equipment with minimum amounts of soap. You improve operations and save time and money in all departments.

SOCONY-VACUUM OIL COMPANY, INC.
26 Broadway, New York 4, N. Y., and Affiliates:
MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

Better Processing for ALL Textiles

Woolens . . . S/V Woolrex Oils improve carding and spinning. Scour out easily.

Worsteds . . . S/V Worstex Oils lubricate stock uniformly. Improve spinning.

Water Repellents . . . Special S/V Products give maximum repellency with minimum amounts.

Finishing . . . S/V Finishing Oils give excellent wetting, re-wetting and softening effects.

Shrinkage Process . . . S/V Finishing Oils insure quick, uniform re-wetting.

Rayon Processing . . . S/V Rayon Oils add softness to rayon fibers.

Process Products
SOCONY-VACUUM

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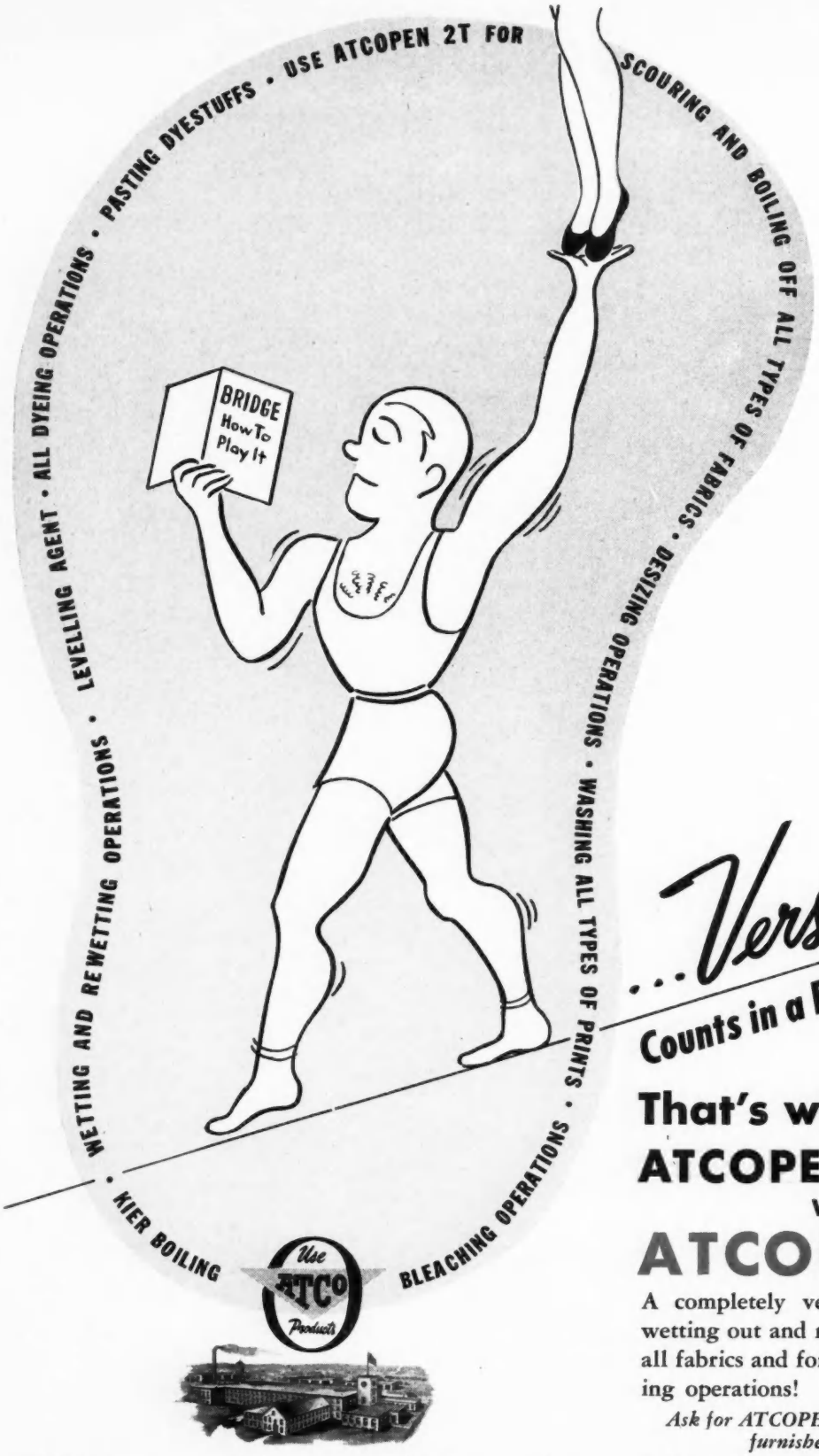
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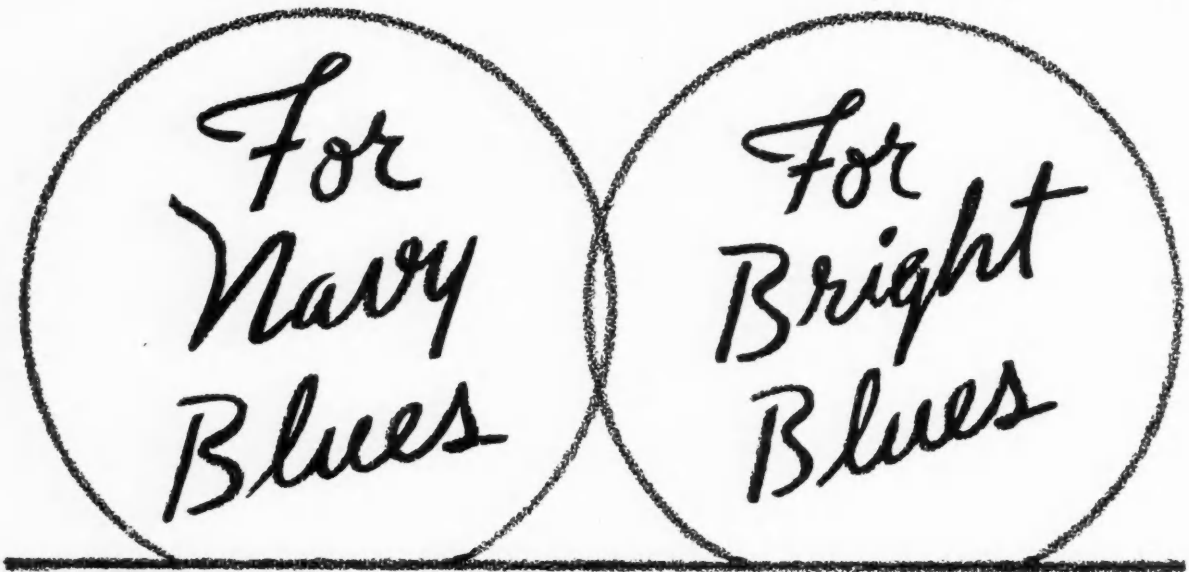

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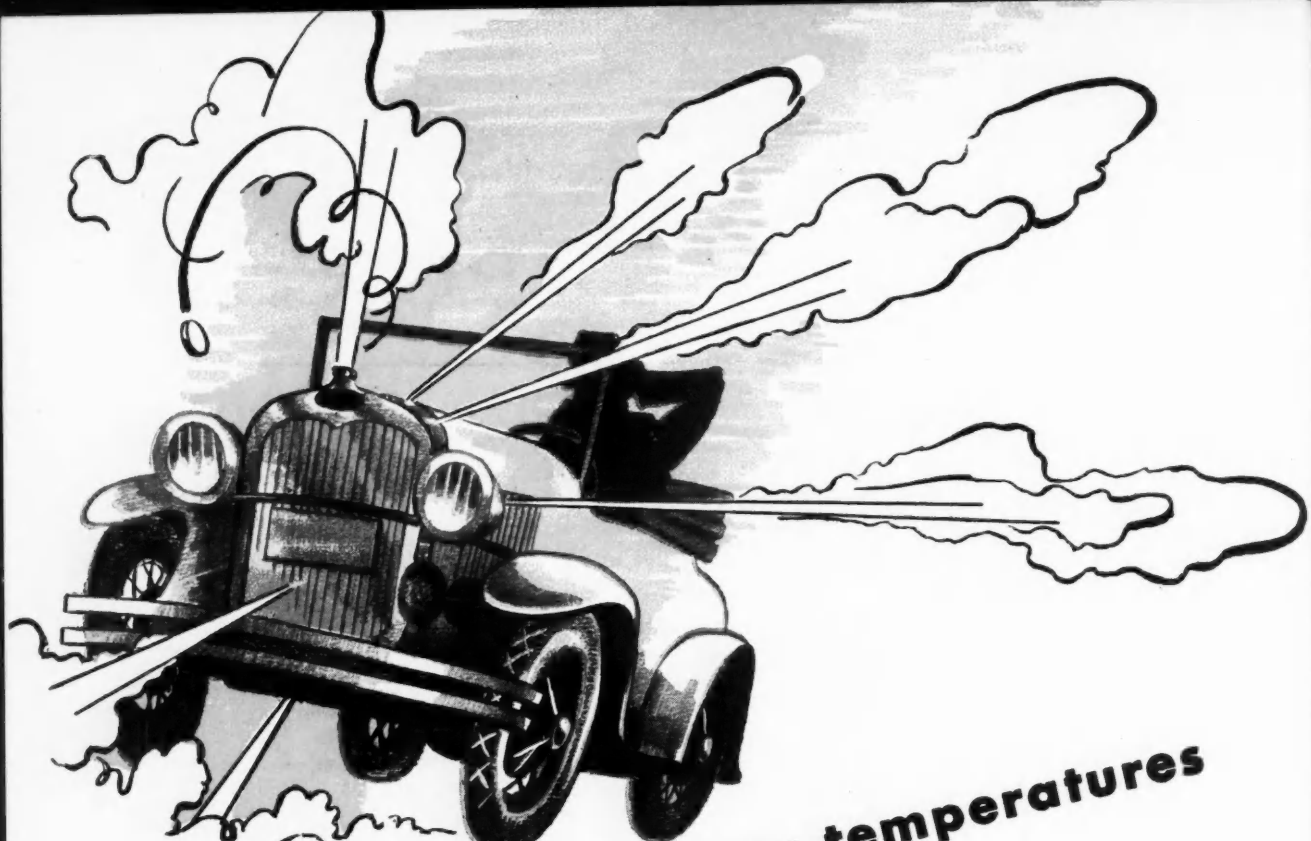

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Proceedings of the

American Association of Textile Chemists and Colorists

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FEBRUARY 23, 1948

South Central Section Meeting

THE regular Winter Meeting of the South Central Section was held at the Hotel Patten, Chattanooga, Tennessee, December 13, 1947, with sixty-five members in attendance.

At the afternoon Technical Session, Dr. Raymond B. Seymour of the Industrial Research Institute of the University of Chattanooga gave the sectional paper he presented at the National Meeting entitled "Effect of Urea on Cellulosic Fibers". A discussion period followed the paper.

At the banquet O. G. Edwards of the Industrial Research Institute gave a very interesting talk on the present textile industry in Germany. Following the war, Mr. Edwards was in Germany for a year as a textile engineer for the U. S. Government.

The following officers were unanimously elected for 1948:

Chairman: Dr. Raymond Seymour, Industrial Research Institute, University of Chattanooga, Tenn.;

Vice-Chairman: J. A. Crumley, Hosiery Processing Company, Rossville, Georgia;

Treasurer: C. P. Gordon, Reigel Textile Corp., Trion, Georgia;

Secretary: Howard Loveless, Crystal Springs Bleachery, Chickamauga, Georgia;

Councilor: Jack Anderson, Peerless Woolen Mills, Rossville, Georgia.

Respectfully submitted,
C. A. Spratt, *Secretary.*

—♦ ♦—

NCSC Student Chapter Meetings

MEETING on Jan. 15, 1948, the North Carolina State College Student Chapter elected R. C. Davis, Chairman; J. R. Cramsie, Secretary; and R. Murray, Treasurer. Dues of $1.50 per member were assessed for expenses. Meetings were planned for every second Thursday. On Jan. 22 there were selected twelve subjects on which speakers would be sought. Three lectures on application of resin bonded pigments to textile fabrics were given by E. R. Adair of the Textile Colors Division, Interchemical Corporation.

Respectfully submitted,
John R. Cramsie, *Secretary.*

Future Meetings, Southeastern Section

THE Southeastern Section announces that Dr. Harold W. Stiegler, Director of Research for the AATCC, will be the speaker at a meeting on March 13th at the Highland Country Club, LaGrange, Georgia. The meeting is scheduled for 8:00 P.M. and will be preceded by a dinner at 7:00 P.M.

Other meetings of this Section are scheduled as follows:

July 24, Atlanta, Georgia.
September 25, Columbus, Georgia.
December 4, Atlanta, Georgia.

—♦ ♦—

ISCC Meeting

THE 17th Annual Meeting of the Inter-Society Color Council will be held at the Hotel Pennsylvania, New York, on March 2nd and 3rd. A discussion session will be held on the 2nd and reports will be presented from sub-committees studying problems on which the Council is currently working. A busineses session is also scheduled for the 2nd. On the 3rd there will be a session on "Color Coordination in Industry" and a number of papers are scheduled for presentation.

Members of the AATCC are invited to attend any of the sessions and a copy of the final program may be obtained from Walter Granville, Container Corporation of America, 38 S. Dearborn Street, Chicago 3, Illinois.

—♦ ♦—

Membership Applications

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Testing Group Meeting—

Estimation of Vat Printing Paste on Cloth and an Electrometric Analysis of the Critical Chemical*

H. E. M. SPECHT

Cranston Print Works Co., Cranston, R. I.

Introduction

WHEN woven goods such as cotton or rayon are printed with vat dyes in yardages running into the scores of millions, the general economy of dyestuff as well as paste usage becomes an important consideration in a print works. As is well known, final coloristic results depend upon a multitude of factors, among which we may class a knowledge of the relationship between materials applied to the cloth in printing, and the cost, appearance, fastness, etc. of the finished piece.

From a cost standpoint the most important materials applied to cotton, with the possible exception of certain finishing agents, are the printing paste and dyestuff. It must be emphasized here that in the case of light shades or fine prints, such as shirtings, the amount and cost of dyestuff becomes almost inconsequential in relation to that of the paste applied, whereas with heavy shades or well-covered patterns, it is the dyestuff as well as the paste which assumes a significant role in the over-all picture of the process.

It was during an investigation of some of the physical and chemical phenomena encountered with printed cotton from the time of printing through the steaming or aging process, that a reliable and simple means of estimating the amount of paste or dyestuff on the cloth was required.

The general field of quantitative dyestuff analysis on cloth has been attacked by many research workers in textile and other laboratories. The methods employed by them fall chiefly into two categories, namely:

1. Chemical analysis of the dyestuff itself.

2. Reflectance spectrophotometry.

Both of these are open to some criticism. The first, so far as vat dyestuffs are concerned, is tedious, lengthy and limited in scope, having, to our best knowledge, been applied successfully to only two vat dyestuffs, Ciba Blue 2 B.D. and Cibanone Navy Blue R.A. ([1, 2]) The second, reflectance spectrophotometric measurements, together with trichromatic analysis, have found considerable and apparently successful application in recent years, but the method is difficult of interpretation, and moreover requires expert manipulation of a costly and complicated instrument, not generally found in possession of our smaller textile laboratories ([3, 4]).

In this laboratory, having experienced varying degrees of success with some attempts at chemical dyestuff analysis, as well as at transmission spectrophotometry of color extracts, an indirect method of approach to the problem was investigated. While the analytical procedures to be described here are somewhat limited in their application, they have the advantage of being simple, and the results obtained have been found helpful to the printer and colorist through yielding important information on the printing paste and its composition.

Theoretical and Experimental

The principal ingredients of most, if not all vat print pastes, are color, thickener, glycerine, alkali, and reducing agent. The substance most frequently used for the latter is sodium sulfoxylate formaldehyde, $NaHSO_2.HCOH.2H_2O$, also called printing hydro,—not to be confused with dyehouse hydro, which is sodium hydrosulfite, $Na_2S_2O_4$.

When a piece of cloth, which has been printed with vat colors and dried, is steamed (or aged) in the conventional manner to reduce the dyestuffs and fix them to the fibers, an oxidation-reduction reaction takes place wherein the sulfoxylate is simultaneously oxidized. This oxidation proceeds in an alkaline medium, hence no gaseous sulfur compounds are evolved and all the products of the reaction containing sulfur remain on the cloth until they are removed by washing in subsequent operations. Very little is known as to the identity of these products of oxidation, except that they probably consist of a mixture of sulfite, bisulfite, bisulfite formaldehyde, and sulfate.

Continuing along these lines of reasoning it was thought that, if the unreacted sulfoxylate, as well as all the products of its oxidation, could be converted quantitatively to sulfate, a means of estimating the amount of print paste or dyestuff on cloth would become a possibility. This has been accomplished in the following manner: The paste ingredients are extracted from the cloth, the sulfur compounds are oxidized in alkaline hydrogen peroxide ([5]), the resulting sulfate is precipitated as barium sulfate, weighed, and the results are converted to per cent paste or dyestuff. If, as may reasonably be assumed, (1) the percentage composition of any one print paste is known and remains constant from batch to batch, and (2) the sulfoxylate formaldehyde used in the paste has a reasonably constant purity (or its average S content has been previously determined), the procedure as outlined becomes applicable in actual plant operations involving large-scale use of raw materials.

In the preliminary experimental work, analyses for sulfur of the sulfoxylate alone showed values considerably higher than the stoichiometric figure of 20.8% for the pure salt. This discrepancy may, however, be readily explained on the basis of the probable impurities in the commercial product, which consists of small amounts of thiosulfate, sulfites and sulfates, arising in part from the manufacturing process and in part from the gradual decomposition of the material in storage. Table I lists the theoretical composition of some of these compounds.

TABLE I

Compound	*Theoretical Composition* % S
$NaHSO_2.HCHO.2H_2O$	20.8
$NaHSO_2.HCHO$	23.9
$NaHSO_4$	26.6
$NaHSO_3$	30.8
$Na_2S_2O_3$	40.5

In the case of each one of the four compounds listed above, the sulfur content is seen to be higher than that of the prin-

* Presented at Testing Group Meeting, Miss Laura E. Pratt, Presiding, National Convention, Chicago, October 24, 1947.

cipal ingredient. A decrease in hydration of the sulfoxylate would, of course, also increase the quantity of sulfur found, as would the presence of traces of hydrosulfite formaldehyde ($Na_2S_2O_4 \cdot 2HCHO$) which may have been used in the manufacture of the sulfoxylate.

A series of six analyses of two lots of sulfoxylate for sulfur gave the results shown in Table II.

TABLE II

Analysis No.	S found %	
1	22.57	
2	22.54	
3	22.94	
4	22.98	
5	23.27	
6	23.05	Av. — 22.99%

Hence the above-mentioned impurities may be considered chiefly responsible for the difference of about 2 per cent in the theoretical and analytical values.

In order to determine the error due to substances in the paste which are oxidizable to sulfates under the conditions of the analysis, pastes were prepared without sulfoxylate and analyzed for sulfur in the same manner as the sulfoxylate; the amounts found for four analyses averaged 0.027%. Furthermore, when six of the most popular prepared vat printing colors were oxidized with hydrogen peroxide, sulfates were found to be entirely absent. The error for a print paste prepared from a certain group of standardized ingredients can therefore be considered as being practically constant and quite small.

Analysis of an actual sample of printed cloth is carried out as follows: 5 to 10 grams of dry cloth (the amount taken depending upon the coverage) are cut into ca. ½" squares, weighed accurately on an analytical balance, and soaked in 200 ml. of cold water for ½ hr. with frequent stirring. The resulting solution is filtered through coarse-textural filter paper to separate the fibers. 1-2 ml. of 6% sodium hydroxide and 20 ml. of 5% hydrogen peroxide are then added to the filtrate and the mixture is boiled gently for 10 minutes, or until all excess peroxide has been decomposed. Filtering through fine-textured filter paper at this point will in most cases remove all the dyestuff present in the extract, the particles having been coagulated sufficiently by boiling in a highly ionized solution. To the clear filtrate a drop of Methyl Red indicator is added and the solution is carefully neutralized with dilute (1:2) hydrochloric acid, and finally acidified with as light excess (1-2 ml.). Subsequent operations involve nothing more than a standard gravimetric sulfate analysis with barium chloride ([6]).

Disregarding the small quantity of sulfate originating from the sulfur-bearing substances in the print paste minus the sulfoxylate, the per cent paste on a piece of cloth is easily computed by means of the following simple formula:

$$P_c = 59.7 \frac{W_b}{S_p \quad W_s}$$

where P_c = per cent wet paste on the cloth
W_b = weight of barium sulfate
S_p = per cent sulfoxylate in paste as made up in color shop
W_s = weight of dry sample of printed cloth

The value of the numerical constant is based upon the gravimetric factor for barium sulfate and upon the empirically determined sulfur content of the sulfoxylate, which in our case was 22.99%.

The method just described, while giving an indication of the total quantity of sulfoxylate present on the cloth or in the paste at the time of printing, fails to furnish information regarding the quantity of active reducing agent in admixture with the dyestuff on the cloth at any point in the process prior to aging. The latter is an important consideration from a practical standpoint.

A search of the somewhat meager literature on the chemistry of the hydrosulfites ([7]) disclosed that sodium sulfoxylate formaldehyde decomposes, that is, loses its reducing power, in the presence of atmospheric oxygen, and also in the presence of moisture, as illustrated by the reactions:

$$NaHSO_2 \cdot HCOH \cdot 2H_2O + H_2O \longrightarrow NaHSO_3 \cdot HCOH + H_2 + 2H_2O$$

$$2NaHSO_2 \cdot HCOH \cdot 2H_2O + O_2 \longrightarrow 2NaHSO_3 \cdot HCOH \rightarrow 4H_2O$$

The rate of the first reaction is much slower than that of the second, but may be increased greatly by the presence of a reducible substance, such as a vat dye (which would react with the hydrogen formed).

During a study of a possible relationship between the behavior of vat dyestuffs and the quantity of active reducing agent present, a simple and rapid analytical procedure was devised for estimating at any time the amount of undecomposed sulfoxylate on cloth printed with vat colors, as follows:

About 5 to 8 grams of dry cloth are cut into ca. 1" squares, weighed in a closed container, and immediately dropped into a 2-liter 3-neck flask containing 400 cc. of water which has previously been saturated with oxygen-free carbon dioxide. Enough formaldehyde is added to give a strength of ½ to 1 per cent and an energetic stream of carbon dioxide is maintained through the solution for a period of 10 minutes, after which the extraction is complete. The extract is thereupon acidified with hydrochloric acid, and the entire contents of the flask are titrated with 2/10 N iodine. Addition of starch solution is not necessary, if the print paste contains starches or natural gums, and the small amount of vat color released into the solution during the extraction period in no way interferes with observance of the end-point.

Several hundred of these analyses have been performed in this laboratory and results have been found dependable and readily reproducible.

For the analysis of sulfoxylate in samples of strong color paste from, let us say, the color tubs at the printing machine, an electrometric method has been developed. In such cases, simple iodometric titration is not applicable, due to the complete masking of the starch-iodide endpoint by the dyestuffs in the paste. For this procedure, a Coleman Model 3 Electrometer, together with a laboratory-type "'redox" electrode system, was employed. Incorporated in the instrument is a direct-reading millivolt scale and a sensitive electronic impulse galvanometer, admirably suited to electrometric analysis. In carrying out the analyses a 2-5 gram sample of print color is rapidly weighed into the titration vessel and enough water is added to submerse the electrodes; after acidification with 5 ml. of glacial acetic acid, the whole is thoroughly mixed by swirling and immediately titrated electrometrically with 2/10 N iodine. The solution may be agitated during the titration with a mechanical stirrer, or better, with a strong stream of oxygen-free carbon dioxide. About 1 to 2 minutes are required between additions of titrant in order to allow the system to return to equilibrium. Voltage changes near and at the end-point are very abrupt, amounting to 200-300 millivolts in most cases, and the plotted curves closely resemble those of a strong acid-strong base titration. The percentage of active sulfoxylate is calculated from the formula:

$$\% \text{ Sulfoxylate} = \frac{(\text{Vol. } I_2) \times (\text{Normality } I_2) \times 154.1}{40 \times \text{wt. of sample}}$$

Attempts to apply a similar procedure to the analysis of potash in the color paste did not succeed, chiefly because, owing to the weakly alkaline character of the paste, the inflections of the titration curve are so far separated or so indistinct as to make the exact end-point undetectable.

(Concluded on Page P130)

Finishing and Auxiliaries Group Meeting—

Synthetic Detergents in Textile Processing*

H. C. BORGHETTY*

General Dyestuff Corp.

THE widespread use of synthetic detergents in the textile field and the continually expanding figures of production clearly indicate that we are dealing no longer with a struggling group of new organic chemicals, but rather with a successful achievement of modern research and development.

To the textile industry goes the credit of pioneering this now well established group of surface active agents which has made so many inroads into industrial fields, some directly related to and others completely divorced from, our field of fibers and fabrics.

The multiplicity of products and the constant introduction of literally hundreds yearly, has already made it difficult to choose the best product from the host at our disposal. Many mill superintendents, chemists and buyers already confess that they are at a loss to make a rapid selection because of the number of products available and the confusion of claims concerning them.

A few years ago it was difficult to convince technicians to try synthetic detergents, whereas nowadays it is becoming difficult to convince users that the particular operation might require a thorough investigation prior to recommending the correct material. Such a condition apparently has arisen from the fact that synthetic chemicals were able to prove that they deserved consideration in places where soap was found lacking; and once this proof was completed and good markets established it was not long before many trade names were coined and hundreds of poor substitute products appeared.

While I would not go so far as to say that the textile operations are so intricate as to require tailor-made synthetic detergents for each use, I feel confident in stating that there is a best product for each type of operation and that the term "Synthetic Detergent" is no longer a "sesame" to all our problems.

* Presented at Finishing and Auxiliaries Group Meeting, Clarence W. Wille, Presiding, National Convention, Chicago, October 24, 1947.

It is quite logical that a pure detergent can be recommended both for a raw stock scouring purpose and for its secondary wetting properties, also for the level dyeing of wool in acid dyebaths; whereas a trade-marked auxiliary product made with the same active ingredient but with the use of soda ash as an extender, would be equal money value with a raw stock scouring agent but definitely hazardous in an acid dyebath. In like manner, a synthetic detergent possessing marked adsorption qualities on cellulosic fibers, because of the presence of fatty groups in the molecule, could impart softening and lubricating properties which are retained by the fiber; whereas a plain Glauber's salt dilution of the active ingredient would possess the same or even greater scouring properties, but might be found surprisingly absent in regard to lubrication.

When the textile specialties on the market were confined to the number of the fingers on one's hand, it was merely necessary for the user to select one having the right diluent, pH and stability, whereas the choice amongst the hundreds has become the textile chemists' nightmare.

The literature on the chemical nature of synthetic detergents, though not abundant, is sufficiently large to make it unnecessary for us to trace their development, which blends in closely with that of all the surface active agents used in the textile industry. It is plain how the true detergents differ from the more simple surface active agents such as the wetting agents, in possessing a long chain, nonpolar structure which when solubilized by introduction of polar groupings, imparts the emulsifying and soil carrying properties for dirt and grease indispensable for good scouring.

After the development of the chemistry of sulfonation, it was possible to impart such properties to modified fatty acids without detracting except from the lubricating properties, while conserving the characteristic frothing, emulsifying and protective colloid properties possessed to a high degree by soap.

Soap is the least complicated, cheapest and most efficient of all the known surface agents. Many of the foremost synthetic detergent manufacturers feel that a true synthetic soap is a goal to be sought. Soap when used under ideal conditions such as offered in soft water areas, and without the use of acids, salts, dyestuffs and other chemicals harmful to it, is an ideal detergent. The strenuous research undertaken by textile chemists to substitute soap was primarily to reinforce its weaknesses. The first synthetic detergents were based on fatty acids and derived simply by substituting the function of the carboxyl group—COOH with the—SO_3H. The perfected synthetic detergents later developed, based on the knowledge acquired from the first experiments, differed mostly in the rearrangement of the chemical structure so as to obtain the necessary increased detergency desired in products to replace soap. This term "replace soap" is used in by no means a derogatory tone; rather should it be understood that the synthetic detergents were developed to supplement soap in those operations where soap was not satisfactory even though its intrinsic properties were recognized. From the speaker's experience the synthetics go hand in hand with soap as true supplements rather than as direct competitors. The claim made by some to the effect that because of the proven value and indispensability of synthetics in specific operations that soap was destined to disappear, are very misleading. The heavy duty washing results characteristic of soap can only be approached by the synthetics when additions to increase the pH, viscosity and suspension properties are made.

The chemical conditions which require the use of stable products excluded soap from certain operations and thus represented open markets awaiting the introduction of synthetics.

The notorious deficiencies of soap in hard water, copper and iron salts, acid conditions, salt baths, chrome liquors and to dry heat, need not be elaborated on,

but certainly prove that the synthetic detergent is the boon companion of soap and not its arch enemy. If I were a soap manufacturer I would feel my service facilities incomplete without the presence of a stable synthetic detergent to complete the line, and I furthermore would want to take advantage of the combination soap-synthetic developed during the war by our armed forces. This proved itself to be an outstanding contribution for all-purpose mobile laundry units because the emulsified lime soap formed was able to stay in suspension and actually increase scouring properties. In this use the two products really met on a common ground and went hand in hand to fill an important function.

In connection with the blending of synthetic and soap in hard water the theory offered that the decrease in foam was caused by a soap-Ca-sulfonate can be disproven by reference to the fact that nonionics also show similar behavior. Our tests indicate that the phenomenon is one of dispersion because the lime soap precipitates always and compels part of the synthetic to act as a dispersant, thus interfering with the surface activity and foam effects.

Considering the classification of detergents, we have three main chemical types according to their ionization characteristics:

(1) The *anion-active* embodying a solubilizing group which imparts to the molecule its ability to function in water solution. Soap belongs to this group as also the great majority of synthetics such as the sulfonated fatty acid esters and amides, the sulfonated alcohols, the alkyl aryl sulfonates and the polyether sulfonates. The long chains present in these products are non-polar akin to grease and soil and thus miscible therewith and subject to removal in the presence of water because of the polarity.

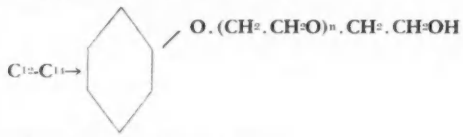
One of the products of this type which is mentioned a great deal in foreign literature and also by the investigating teams returning from Europe, is the sodium salt of the condensation product of oleic acid chloride and sarcosine—$HN(CH_3).CH_2COOH$, and has the formula $C_{17}H_{33}CO.N(CH_3).CH_2.COO.Na$. This detergent, in which the carboxylic group characteristic of soap is retained, is not completely stable to hard water but is superior to soap in this respect. It is considered to have a specially mild action on the skin and may be incorporated into shaving soaps. Its use in the textile industry has been known here for many years, particularly as a fulling compound.

(2) The *second* type of detergent is *cation-active* and has a polar group which is part of the negative charge of the molecule thus leaving the large bulky portion in the plus charge; hence the name. This type has few representatives and is of value only for few cleansing uses. The reverse charge is logically not suited for all scouring functions because of the contradiction evident with the anion-active theory given above. For mineral oil removal they are very valuable at times. As a group they are more popular when manufactured with emphasis on the softening properties and dye-fixing properties, rather than on detergency.

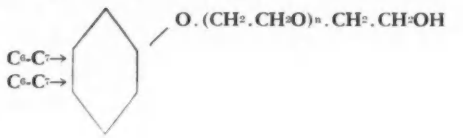
(3) The *third* type, known as the *non-ionics,* are relatively new and of interest wherever absence of chemical activity and compatibility with all types of compounds are needed. Unquestionably the increasing use of cation-active finishing agents excludes the presence of anion-active materials and opens a field for the non-ionics.

In view of the lack of a solubilizing polar group the representatives of the series usually possess polymerized oxyethane bridges which impart the solubilizing effect. A consequence of their chemical nature is the lack of substantivity for textile fibers which results in lack of lubrication but also means quick rinsibility. Some are soluble or miscible with non-polar liquids such as kerosene, thus opening up the possibility of combinations therewith of value as self-scouring lubricants a field that in our age of high speed weaving requirements gives opportunities to eliminate objectionable loom stains. The best known representatives of this group are condensation products of alkyl phenols and ethylene oxide, and their special importance is that no fats are required for their manufacture. They may either contain one long alkyl chain of 12-14 carbon atoms, or may be made with two shorter chains of 6 or 7 carbon atoms, as illustrated by the following formulae:—

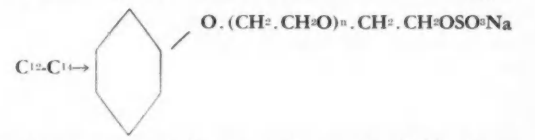
Example with one long chain:



and with two shorter chains:



The value of n, which determines the degree of solubilization of the product, varies with the nature of the alkyl chain, also with the use to which the detergent is to be put. If it is to be used for cotton washing, the value of n varies from 8 to 11, and is higher than if the product is required for wool washing where n varies from 5 to 8. The above types both show decreased solubility in solution as the temperature is raised, and accordingly decreased washing efficiency. A third and more highly soluble type has therefore been made by sulfating the end (OH) group of the above. This is used either alone or as an addition to the first two types to improve their solubility and washing efficiency at temperatures near the boil. The sulfated product is of the type:—



Owing to the increased solubilization occasioned by the sulfate group, the value of n in the above is less than in the unsulfated types, and varies from 2 to 5. By sulfonation of course, we pass away from the non-ionic and back into the anionic type which emphasizes the flexibility of the sulfonation process utilizing raw material other than fats.

All the above types have appropriate functions and possess emulsification and wetting properties because of their surface active effect of concentration at the surface or at the interface. The uses to which they have been put in the textile processing operations are well known to most of you so I would prefer to confine my remaining remarks to the uses which it appears have not been fully exploited and for which the modern streamlined trend in finishing plants opens added possibilities.

The immediate use of a detergent is of considerable help to the first operation given to cloth in a finishing plant and experience indicates that a desizing assistant possessing detergent properties in addition to simply wetting-out can carry

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Finishing and Auxiliaries Group Meeting—

Trends in the Evolution of Fire-Resistant Textiles*

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THE appearance of any new technique of spinning, weaving, dyeing or finishing in the field of textiles immediately stimulates a host of questions as to "what", "where", "why" and "how". I trust that in the following discussion I have been able to anticipate some of the many questions that have occurred to you regarding "what" flame-resistant and flameproof finishes are, "where" they are applicable in the broad field of textiles, "why" such processes should be of interest to you of the textile industry and "how" the desired performance characteristics can be obtained.

Those of you who have followed the development of fire-resistant fabrics in recent years have probably been as confused as I by the loose terminology employed in describing the various degrees of resistance to fire. The resistance of fabrics to flaming combustion has been variously described as "flameproof", "flame-resistant", "fire-resistant", "flashproof", "fireproof", "flame-retardant" and other similar terms. A simple classification which should serve to clarify the degree of flame-resistance desired for particular end-uses would be the grouping of all textiles as "non-burning", "slow-burning" or "fast-burning" materials. The only testing procedures required to separate these three groups would be one to differentiate between non-burning and burning fabrics and a second to distinguish between slow-burning materials and these which are so highly flammable as to constitute a hazard for particular applications. Suitable burning tests are now available for these purposes. The vertical-Bunsen flame test is perhaps best known and most widely employed in identifying non-burning fabrics and evaluating the relative efficiency of the flame-proof properties. The 45° flammability test of the AATCC and the horizontal rate-of-burning test of the Bureau of Standards both serve to separate "slow-burning" and "fast-burning" fabrics. The selection of the test and the burning time to be specified should be based upon the expected performance of the particular material in actual usage.

Flammability Legislation

Recognition of the extreme flammability of certain textile fabrics and the hazards occasioned by improper use of these materials is not a recent development. At the Eighth International Congress of Applied Chemistry held in New York in 1912, the British delegates sponsored a symposium on the flammability and flameproofing of fabrics. On August 15 of the following year, the Fabrics (misdescription) Act was passed in England which made it unlawful to sell, or have in possession for sale, any textile fabric represented as non-inflammable, by claim or by inference, unless it conformed to certain standards of non-inflammability prescribed by the Secretary of State. Since this law pertained to piece goods or finished garments the responsibility fell primarily with the manufacturer of the cloth. The absence of any label inferred that the fabric met the requirements of the Home Secretary.

On January 27, 1945 the California State Legislature passed a bill governing the manufacture or sale of flammable or "explosive" fabrics. The original bill covered a wide variety of textile materials and was practically unenforceable since it based its definition of flammability on the performance of "cotton cloth in its natural state". An amendment offered by the State Fire Marshall on March 6, restricted the act to articles of wearing apparel, based the flammability of a fabric on its performance under specified test conditions but still aimed the action primarily at certain synthetic fibers and finishes. After considerable cooperative study with the AATCC Flammability Committee, NRDGA and other interested groups, the California Inflammable Fabrics Act[1] became effective on January 6 of this year. In essence, the act forbids the manufacture or sale of any textile item intended to be worn on the person which fails to meet the prescribed tests. There are certain exceptions such as footwear, gloves, hats, billfolds and similar accessories. Although relatively few textile materials are affected by these regulations, yardage goods of a highly flammable nature are also covered in that they must be suitably labeled regardless of the end-use for which they are intended.

As might be expected, legislation of this nature aimed at improvement of public safety, has not been slow to spread. A short time ago as many as 24 of our states had some form of similar legislation under consideration. Fortunately, the introduction of similar bills in Congress offers some hope of uniform national regulation rather than a series of independent and greatly divergent state laws. The first of the Federal bills was introduced in the House of Representatives by Rep. J. Leroy Johnson of California on March 6, 1945 (H.R. 2496). This bill was patterned after the original act in California and suffered from the same weaknesses. Considering the original bill inadequate, Rep. Johnson introduced a second (H.R. 5445) on February 11, 1946. In this case the regulations were aimed at napped and piled fabrics only since an "inflammable textile fabric" was defined as "any textile fabric of combustible fibers which have a nap or pile and which flash or burn in horizontal position . . . at greater average rate than 1 inch per second. . ." The reference test in this case was the horizontal rate-of-burning test of the Bureau of Standards.[2] This second attempt apparently never progressed beyond hearings before the Committee on Interstate and Foreign Commerce. During the 1947 session of Congress four bills were introduced, three in the House and one in the Senate.[3] The

* Presented at the Finishing and Auxiliaries Group Meeting, Clarence W. Wille, Presiding, National Convention, Chicago, October 24, 1947.

[1] Wearing Apparel, Minimum Fire Safety Standards, California Administrative Code Title 19, Chapter 7.

[2] National Bureau of Standards Circular No. C455; "Flameproofing of Textilles".

[3] HR 505; Rep. Gordon Canfield, N. J.—Jan. 6, 1947.
HR 601, Rep. J. Leroy Johnson, Cal.—Jan. 7, 1947.
HR 1111; Rep. Wat Arnold, Mo.—Jan. 20, 1947.
S 353; Sen. Homer E. Capehart, Ind.—Jan. 24, 1947.

Canfield and Johnson bills were very similar, the former being nearly identical with H.R. 5445 presented by Rep. Johnson the preceding year. The latest Johnson bill refers to any textile fabric regardless of end-use and specifies that "if flameproofing is applied to meet the requirements it shall be permanent for the life of the textile". Both were based upon the horizontal rate-of-burning test of the Bureau of Standards. The Arnold bill in the House and the Capehart Senate bill were identical and represented the recommendations of the National Retail Dry Goods Association. The testing procedure in this case was the 45° Flammability Test of the AATCC; a dangerously flammable fabric being one which burned five inches in less than six seconds when inclined at an angle of 45° under the specified conditions. The twin bills applied only to articles of wearing apparel, although labeling was required for yardage goods which failed to meet the test. Public hearings on the three House-sponsored bills have been completed but the 80th Congress adjourned on July 31st without any hearing on Senate bill S-353 before the Interstate Commerce Sub-Committee of the upper House. There has been considerable difference of opinion regarding the desirability and advisability of this national legislation and as it now stands, no further action can be taken until Congress reconvenes in January. The rules and regulations contained in the Arnold and Capehart bills have been included in a Recommended Commercial Standard for Flammability of Textiles[4] circulated by the Division of Trade Standards of the National Bureau of Standards. The opinion has been expressed that if such a voluntary standard is accepted by the industry as a whole, further legislative action may not be considered necessary. It appears questionable, however, that such voluntary regulation would succeed in preventing the enactment of many divergent regulatory measures in the several interested State Legislatures. There is no doubt, in that event, that a carefully prepared and equitable Federal Law would be much more desirable.

Thus far we have considered only that legislative action concerned primarily with the flammability of clothing fabrics. It is the intention of these measures to prevent the use of fast-burning materials in articles of wearing apparel. A second group of regulatory acts is aimed at the elimination of flammable fabrics as structural or decorative materials in restaurants, night clubs, hotels, theatres, churches and other places of public assembly. Since 1940 and even earlier many of our cities have had municipal ordinances of this nature, though enforcement has not always been actively practiced. Nevertheless, adequate regulations pertaining to flameproof decorative materials do exist in New York[5], Boston[6] and many other of our larger cities. The State of California has for some time restricted the use of flammable fabrics in the construction of tents and for decorative materials to be used therein. This has been enforced under Chapter 727 of the General Laws of that State.

On September 19th, two State Statutes, Assembly bill 753 and Senate bill 1463, went into effect in the State of California. This most recent legislation is aimed at control of the use of flammable decorative materials in all places of public assembly. Undoubtedly, such measures will spread to other states and probably in time become nationwide in scope.

Certain differences should be pointed out between these decorative fabric regulations and the clothing fabric acts. In the case of the materials for clothing fabrics the responsibility is placed on the seller of the merchandise, either manufacturer, wholesaler or retailer. The fabrics generally may burn, but must be in the slow-burning category, and the flame-resistant treatment must be resistant to wet and dry cleaning operations. In the case of the decorative fabric regulations, the responsibility for compliance rests with the purchaser and user of the material. The fabrics in this case must be of the non-burning type and, in general, resistance to washing and dry cleaning is not included in the requirements, provided continued performance is insured by periodic inspection.

To indicate the trend in the field of flame-resistant textiles, one has only to note the actions of trade committees and industrial groups. Many industrial plants have long practiced the flameproofing of coverall work garments. The Civil Aeronautics Board has recently required the elimination of fast-burning fabrics from all air carrier aircraft. Committees of ASTM and the Society of the Plastics Industry are considering the flame-resistance of coated fabrics, unsupported films, upholstery and floor coverings. Finally, the AATCC Committee on the Fire Resistance of Textile Materials has formed sub-committees to investigate suitable testing procedures for fire-resistant clothing fabrics, drapery and decorative materials, coated fabrics, unsupported films and canvas and utility fabrics.

[4] Recommended Commercial Standard for Flammability of Textiles. TS-4350, March 12, 1947.

[5] Section 665, Subdivision C, of the New York City charter, May 27, 1940.

[6] Section 28, Paragraph L, General Laws (Ter. Ed.) as amended to 1946.

Fabrics Affected

What does all this mean to you right now? Relatively few textile fabrics are greatly affected by the existing laws in California or the pending national legislation. The California act covers four general groups of materials; (1) those having a napped or piled surface, (2) coated fabrics and unsupported films, (3) sheer or lightweight fabrics such as voile, marquisette, chiffon, veiling and netting, and (4) any other material which is fast-burning and does not fall in the other three groups. Since the temporary suspension of the third and fourth groups last February, the principal fabrics which are now affected are brushed rayon materials with a high nap, chenille products, pyroxylin-coated fabrics and nitrocellulose films. The proposed national regulations cover practically the same field and hence would add the sheers such as voile, netting, veiling, marquisette, etc., to this group. With all of these materials the requirement is that they shall be slow-burning in nature. In actuality no fast burning material can be manufactured or sold for clothing purposes and if intended for other end-uses must be labeled as dangerously flammable.

The many municipal ordinances and the recent California measure pertaining to decorative fabrics cover the majority of drapery and curtain fabrics. Any material of this type intended for decorative purposes in places of public assembly must be of the non-burning type, either naturally or as a result of a flameproofing treatment. Since the quality of resistance to cleaning is not required in many instances, the processing of these fabrics is often handled by the purchaser. As was pointed out earlier, the responsibility in this case lies with the purchaser and user of the fabric and not with the manufacturer or seller.

In addition to these applications wherein resistance to fire is required by law, there are several types of clothing and decorative fabrics with which the property of flameproofness could be made to appeal to the buyer as an added sales point. The outstanding examples are the housewife's apron, children's clothing, drape and slipcover materials and work garments employed in industrial plants. The public as a whole is slowly becoming aware of the availability of non-burning fabrics and a properly conducted sales campaign could profit by the ever-present desire for greater personal safety. According to the estimate of the National Fire Protection Association, there were approximately 585,000 fires in this country in 1945, 276,000 of which occurred in private dwellings and an additional 47,000 in apartment and rooming houses.

The kitchen is probably the source of the greatest number of home fires and the housewife is particularly vulnerable because of the combustibility of the clothing which she wears while working near, and even over, open flames. Children have always had a strong desire to play with matches and undoubtedly always will, in spite of the educational efforts of fire-prevention agencies. The consequences can be rendered much less painful, however, if the child's clothing is non-burning in nature, or at least sufficiently slow-burning to remove the element of panic and permit shedding the burning garment before serious injury has been suffered. An appalling number of private homes and corporate dwellings are destroyed by fire in this country each year. Regardless of the particular source of ignition in each case, the contents of the home which are most easily ignited and subsequently burn violently enough to rapidly get beyond control are almost entirely textile fabrics employed in upholstery or in curtains and draperies. The flameproofing of these few consumer items in the home should go far to reduce the incidence and severity of household fires.

Until quite recently, accidental fires of this nature were attributed to carelessness, stupidity, ignorance or misfortune and little could be done to prevent them other than to educate regarding the hazards of fire and the proper combative methods. It is now possible for a wholesaler or retailer of decorative fabrics ot offer to the consumer non-burning fabrics in replacement of the most combustible contents of the home.

I would like to consider the means of achieving the desired resistance to fire by reviewing briefly the mechanisms by which flame-resistant compounds are believed to function and the practical formulations employed in their commercial applications. Thus far the majority of these more fundamental considerations are confined to cotton and rayon fabrics.

Mechanisms of Flameproofing

The chemical nature of the active ingredients of flameproofing formulations and the mechanisms by which they function have been at least partially revealed by the many war-time researches of industrial groups and Government laboratories. The over-all picture of the requirements of a flameproofing agent is that it shall be intimately mixed with the fibers and be capable of performing its function at the time the material reaches flame temperatures. In many cases the actual active ingredient cannot be affixed to the fabric as such due to its fugitive nature or the degrading action it may exert. Therefore it must be released at the proper time and in the proper place as a result of a reaction occurring at the time of incipient flaming.

When heated to temperatures approximating that of a flame, cellulose is degraded into three phases; a solid char, a volatile liquid of tarry nature and a gaseous fraction. Several independent investigations have shown that the occurrence of flaming combustion depends upon the relative amounts of these decomposition products and the rate at which they are formed. Since flaming is essentially the rapid oxidation of a combustible vapor, the prevention of flaming could theoretically be accomplished by retaining all decomposition products in the solid and gaseous phases. The ideal case, then, would be a quantitative transformation of cellulose into carbon and water. The absence of any intermediate decomposition products of a combustible nature would preclude the occurrence of a flaming reaction. In actuality, the addition of a flameproofing agent to cellulose does markedly increase the amount of char formed on thermal degradation. Furthermore, the effect is proportional to the efficiency of the material added in actually preventing flaming in practical burning tests. Contrary to early beliefs the truly gaseous products do not play a major role in flameproofing reactions. The amount and rate of gas formation is increased upon the addition of flameproofing salts but there appears to be no change in the flammability of the gases evolved. Even more conclusive is the fact that the effect of salts upon the gases formed is fairly constant irrespective of the efficiency of the compound as a flame-retardant. The volatile, liquid tarry products, on the other hand, are highly combustible and serve as fuel for the flame. The addition of flame-retardant salts reduces the amount of tar formed and the reduction is proportional to the efficiency of the added salt in the prevention of flaming. When actually evolved, the tarry products are accompanied by appreciable quantities of water. At the same time that the amount of tar is reduced by retardant action, the quantity of water formed is materially increased. In summary then, the effect of a flameproofing material upon the thermal decomposition of cellulose is to confine much of the flammable, liquid degradation products to the solid char phase and, at the same time, dilute the remaining combustible vapors with large amounts of water.

Many divergent theories have been advanced to explain these observed effects in terms of chemical and physical relationships between the fiber and the retardant. A purely physical mechanism which has been suggested is the coating of the fiber or thread with a glass-like material which serves as a barrier between fabric and flame. There is evidence to support such a mechanism in many cases, although the nature of the coating appears more often to be foam-like rather than glassy. In agreement with the observed effects, combustible tarry degradation products are apparently entrapped in the coating and further degraded to the gaseous and solid phases.

Many compounds, particularly the ammonium halides and other ammonium salts are believed to function by the evolution of large quantities of non-combustible vapors which serve to dilute the combustible atmosphere surrounding the fiber. This may well contribute to the overall effect in many cases. That it is a major factor is unlikely, however, considering the much greater amounts of gases produced by the degradation of cellulose itself.

A third physical mechanism advanced is that some compounds reduce flaming by the absorption of large quantities of heat as a result of physical changes in the retardant. The evidence appears to be against such a phenomenon.

Probably the best existing theories of the manner in which flameproofing agents perform are two which regard the relationship as chemical rather than physical. The first of these, in agreement with the ideal case wherein cellulose is transformed to carbon and water, proposes a catalytic dehydration action at flame temperatures. This is strongly supported by experimental data, by the known dehydrative properties of many of the acid anhydrides, and by the relative performance of those salts which can liberate the acid residue on heating as compared with those which are thermally stable.

The same phenomena are interpreted in different terms, according to the second of these theories, as being a question of comparative hydrogen bonding energies. This proposal is also supported by the data available and by the fact that the anhydrides formed from inorganic acids and their acid salts possess high hydrogen bonding activity. The formation at flame temperatures of a residue capable of attracting and holding adjacent cellulose chains would certainly tend to increase the average size of fragments formed and increase the solid char at the expense of the volatile tarry vapours.

The mechanisms discussed thus far have considered only prevention of the flaming of a fabric. It has been recognized recently that the phenomenon of afterglow is an entirely different reaction, independent of the afterflaming tendency. Whereas there are innumerable compounds pos-

sessing flame-retarding properties, there are very few glowproofing agents and only two theories of their method of operation. Certain salts have been found to produce a more or less continuous film on the surface of the fiber when heated to flame temperatures. Since afterglow is the oxidation of the residual carbon filament, the exclusion of oxygen resulting from such a coating would be expected to reduce the glowing tendency.

A more efficient and better substantiated mechanism is a catalytic effect on the course of the oxidation of carbon. The amount of heat evolved in the oxidation of carbon to the dioxide is approximately 3.5 times that evolved in forming the monoxide. The preferential formation of CO rather than CO_2 apparently reduces the heat evolved to a point where it is insufficient to support a self-sustaining glowing reaction.

In considering the nature of flameproofing compounds and their mode of action, it is apparent that in many cases more than one of the suggested mechanisms may function concurrently. This is particularly true because of the chemical complexity of some of the commercially available flameproofing formulations.

Types of Treatments Available

The classification of a compound or mixture as a flameproofing agent should be based upon the effectiveness of the material in preventing the flaming of a fabric. The addition of any non-flammable substance will reduce the flammability of a fabric. In order to qualify as a true flame retardant, however, the effects should be obtainable at relatively low add-ons by one of the mechanisms mentioned previously, rather than by merely diluting the combustible material.

Of the many flameproofing compounds now commercially available, the majority consist of water soluble salts or mixtures which fall into the category of temporary or transient treatments. The grouping of these materials may be based upon their chemical nature and the mechanism by which they are believed to function.

Borax, aluminum sulfate and mixtures of borax and boric acid or borax and the ammonium phosphates represent the class of retardants which function by virtue of a physical coating phenomenon. These are generally highly hydrated, low melting salts or mixtures. Phosporic and sulfuric acids and their ammonium salts, ammonium molybdate, zinc chloride and antimony oxychloride are examples of the group covered by the catalytic dehydration or hydrogen bonding theories. In agreement with the proposed mechanisms, the salts in this category must be capable of releasing the acid anhydride on heating. Finally, the carbonates, ammonium halides and other ammonium salts fall in the class capable of generating a non-flammable atmosphere when heated.

The temporary, water-soluble treatments possess the advantages that they are easily applied, are extremely effective at relatively low add-ons and do not greatly effect the desirable physical characteristics of the fabric such as hand and color.

The flame-resistant properties are purely temporary, however, any exposure to water completely destroying the effectiveness of the treatment. Accordingly, these materials are applied with the intention of periodic testing and reprocessing. The most serious disadvantage of the water soluble salts is their tendency to undergo physical or chemical changes on exposure to high temperatures or humidities or even on prolonged exposure to normal environmental conditions. In many instances, the residue remaining is either no longer effective as a flame-retardant or is acid or basic in nature thus having a deleterious effect on the fabric. Unless careful periodic testing programs accompany the use of water soluble salts, considerable uncertainty may exist regarding the flame resistance remaining at any given time in the life of the fabric.

A great many flameproofing compositions have been advanced for imparting more or less permanent flame resistance to fabrics. Relatively few of these, however, have proven themselves capable of practical commercial application. A simple subdivision of the available processes would be, those in which the active retardant ingredients are physically bound to unmodified cellulose fibers, and a second type, which depends for its effectiveness upon chemical modification of the cellulose molecule.

The earliest approach to permanent flameproofing was of the former type, employing a double bath technique. This consists of depositing an insoluble salt in and on the fibers by immersing the fabric in two aqueous solutions, the dissolved solids reacting either at the moment of immersion in the second bath or during subsequent drying. A typical example is the Perkins Process wherein hydrated stannic oxide is precipitated by successive immersions in sodium stannate and ammonium sulfate solutions. A novel adaptation of the same principle lies in dissolving both salts in a suitable organic solvent, depending upon subsequent exposure to water or to water vapor to bring about the desired interaction. The two-bath processes in general benefit by good penetration and distribution and have relatively little effect upon the hand and appearance of the fabric. In most cases, however, they require moderately high add-ons and are progressively susceptible to laundering. They may be regarded as intermediate between water soluble salts and the pigment dispersion formulations.

At present, the most common approach to permanent flameproofing, is the use of pigment dispersions. In essence, the insoluble retardant is applied to the fabric in a finely divided state by means of solvent suspension or emulsion vehicles. Many types of inorganic and organic flameproofing compounds can be applied in this manner, the most widely used combination in the past being a mixture of metallic oxides and chlorinated waxes or resins. Several commercial products or finishes of this type are available for use today.

The criticisms of such formulations are the high add-ons required and the corresponding effects on the physical characteristics of the fabric. On the credit side there are many advantages. The flameproofing process leaves the fabric with its original tensile strength or may even produce a gain in strength. The treated fabrics possess the greatest resistance to wet and dry cleaning operations of any of the insoluble flameproofing processes. The compounds are generally very easily applied on available finishing equipment, require only normal drying temperatures and permit very fast running speeds. Coloring pigments may be included in the formulation, or where desirable, proper compounding can result in various degrees of stiffness similar to permanent sizing effects. Finally, in the proper selection of fabrics it is possible to turn the loading into material advantage for the finisher or converter, by permitting the use of lower-count, lighter-weight materials for certain end-uses.

The last mentioned process for obtaining permanent flameproofing, and the latest to be adapted to commercial operations, consists of a chemical modification of the cellulose molecule. The principal application thus far has been the esterification of cellulose with inorganic acids, notably phosphoric. The resulting phosphate ester is rendered resistant to laundering by the formation of complex salts of the unreacted acid groups, the permanence being proportional to the complexity of the amide formed. The principal advantages of this type of process are that efficient flame and glow resistance can be achieved with somewhat lower add-ons that in the case of the pigment dispersion techniques and there is less effect on the physical characteristics of the fabric. Principal criticisms at the present itme appear to be related to secondary effects of the esterification reaction. The treat-

ment is accompanied by losses in fabric strength, the strength decreases being proportional to the permanence achieved.

Also, by virtue of the nature of the retardant complex, the treated fabrics possess limited resistance to laundering operations.

During the past year or two, considerable progress has been made in the development of commercial flameproofing compounds and processes. The exhibits at this convention demonstrate the effectiveness and versatility of treatments now available to the textile industry. Increased activity on the part of manufacturers of textile auxiliaries and industrial chemicals promises continued refinement of flameproofing materials, but the treatment of fabrics to render them resistant to fire has progressed beyond the novelty stage and materialized as a finishing technique already capable of meeting the majority of requests for its application.

New Approach to Fire Prevention

In this same vein, I would like to close with a brief presentation of what I believe to be one of the most important applications of flameproofing processes in the field of textile fabrics.

Uncontrolled fire has long been recognized as one of our most powerful enemies. A study of the records of the National Fire Protection Association will disclose the magnitude of the financial losses suffered each succeeding year, and even more important, the staggering loss of life resulting from all types of fires. The incidence of fires in this country has increased steadily during the past 20 years. Present figures indicate 580,000 to 600,000 fires per year with annual financial losses of 450 to 500 millions of dollars. The loss of life can be approximated on the basis of incomplete reports for the period from June 1930 to March 1940. The financial loss in this period amounted to 319 million dollars annually and the resulting loss of life over the 10 year period was approximatey 13,000 lives. The number of persons suffering painful or serious injury in the same period was certainly many times as great.

Of the great number of fires occurring in this country, approximately half take place in private dwellings, and a large part of the remainder in apartment and rooming houses. At this time, however, I would like to consider only those originating in restaurants, night clubs, theaters, hotels and similar places of public assembly. For some time, active measures have been taken to regulate the construction of places of public assembly and provide suitable fire-protection and fire-combatting facilities. In addition, vigorous campaigns in public education have been conducted. The consistently high incidence of fire, however, indicates these measures to be only partially effective and apparently inadequate. Graphic evidence is furnished by disasters such as occurred in the Cocoanut Grove in Boston, the LaSalle Hotel in this city, the Hotel Winecoff in Atlanta, and innumerable others. The availability of commercial finishing techniques for the flameproofing of textile fabrics offers the possibility of a campaign for true fire prevention.

The experiences of the armed services in the development of incendiary weapons during the recent war demonstrated the difficulty in initiating major conflagrations in a room devoid of furniture and decorative materials, even in all-wooden structures. I dare say all of you have experienced, at some time, the difficulty in igniting pieces of wood without suitable, finely divided, highly combustible material. Given all the matches or other sources of ignition you wish, you would find it nearly impossible to start a fire in a room with wooden walls and floor from which all curtains, draperies, stuffed furniture and rugs had been removed. Transfer consideration to buildings such as this one, constructed almost entirely of concrete and steel, and the implication is obvious.

It is apparently almost impossible to remove all sources of ignition in places of public assembly. We insist on smoking at all times, and defects in electrical wiring and similar accidental sources cannot be entirely prevented. It is entirely possible and practical today, however, to remove all flammable upholstery and decorative materials which by virtue of their combustibility turn a burning match into a major conflagration. A flame cannot survive without adequate fuel; thus the simplest definition of such a fire-*prevention* campaign would be, "no fuel—no fire".

Discussion

Dr. Coughlin: The flaming rate in the horizontal test of the Bureau of Standards is one inch per second. That in the 45° angle test used by A.A.T.C.C. I believe is six inches in seven seconds. It would seem then, leaving out other considerations, that the A.A.T.C.C. test is a little more severe than that of the Bureau of Standards.

Dr. Little: I would say it is appreciably more severe. The burning rate of the horizontal test, five feet a minute, is a rather dangerous rate. There are a good many pyroxylin coated fabrics that burn much slower than that.

Dr. Coughlin: Over a long period of years, the application of flameproofing agents to thermoplastic yarns has been rather difficult. Do the processes that you have apply to thermo-plastic yarns as well as to cellulosic yarns?

Dr. Little: I would say, in general, no. Some of the emulsion or pigment dispersion type processes can prevent the burning of cellulose acetate, for instance, but the mechanism by which they prevent the flaming is certainly different from the mechanism by which they prevent the burning of cotton fabrics. The add-ons required are generally much higher, making it appear that the physical mechanisms perhaps are becoming more important and the chemical mechanisms less important. In some cases, water soluble salts which are relatively effective on cotton fabrics are not only not effective with acetate, but actually increase the rate-of-burning. It is unfortunate that so little is known with respect to cellulose acetate; and until more is known, it is exceedingly difficult to select flameproofing treatments for thermo-plastic fibers.

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CALENDAR

PHILADELPHIA SECTION

Meetings: February 27, April 9, May 14 (Kugler's, Philadelphia); Outing: June 11 (Atlantic City Country Club, Northfield, N. J.)

NEW YORK SECTION

Meeting: March 12 (Hotel New Yorker, N. Y.); May 7 (Swiss Chalet, Rochelle Park, N. J.); Outing: June 18 (North Jersey Country Club).

PIEDMONT SECTION

Meetings: Apr. 3 (Robt. E. Lee Hotel, Winston-Salem, N. C.); June 18 (Ocean Forest Hotel, Myrtle Beach, S. C.).

NORTHERN NEW ENGLAND SECTION

Meetings: March 19 (Boston); April 16 (Lowell Textile Institute); May 21, June 11 (Outing); September 24 (Andover Country Club); November 19.

MID-WEST SECTION

Meeting: February 28 (Bismarck Hotel, Chicago).

SOUTHEASTERN SECTION

Meetings: March 13 (Highland Country Club, LaGrange, Ga.); July 24 (Atlanta, Ga.); September 25 (Columbus, Ga.); December 4 (Atlanta, Ga.).

SUB-COMMITTEES

Meeting: April 1 (Hotel Pennsylvania, New York).

COUNCIL

Meeting: April 2 (Hotel Pennsylvania, New York).

RESEARCH COMMITTEE

Meeting: April 2 (Hotel Pennsylvania, New York).

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Secretaries of Local Sections should send notices of future meetings to the REPORTER as far in advance as possible.

Intersectional Contest ☆First Prize Winner☆

An Electrolytic Method for Stripping Color from Dyed Wool*

By ERNEST R. KASWELL AND GEORGE THOMSON

Presented for the

NORTHERN NEW ENGLAND SECTION

I—Introduction

FOR the past ten years, the United States, on the average, has consumed about 425 million pounds** of wool per year. Since wool is not an inexpensive commodity, the demand for cheaper grades of woolen goods has forced the manufacturer to blend, in various amounts, less expensive vegetable fibers and cheaper reworked wool with more costly new wool. A wool waste industry thus exists in this country which furnishes as much as an additional 100 million pounds† of reprocessed and re-used woolen fiber to the industry, or 20% of the total amount used. Such wool waste may come from the manufacturer's own mill in the form of soft wastes resulting from carding, combing, and drawing operations; hard wastes which are usually twisted yarns; and finishing wastes consisting of flocks from scouring and fulling, sheer flocks, short ends and sample wastes. In addition, there are available as useful materials, all the clips produced by the cutting trade during the course of manufacture of apparel and other textiles—e.g.; suitings, overcoatings, dress goods, knit goods, and the like. Fiber from such materials which has never been used is called reprocessed wool. Lastly, fiber from rags which have already had a useful life is called re-used wool.

Both new and old woolen and worsted clips and rags, are collected, sorted, cleaned and classified according to quality, cleanliness, and color. The price which such sorted materials will command is based upon fiber quality, color, and the ease and extent to which the color can be removed (stripped) so that the fiber may be re-dyed. Whites, of course, command the highest price because they may be dyed to any shade. Dyed clips and rags are worth somewhat less because they must be stripped of their color before they can be redyed with lighter shades. This requires an added operation. Darker shades which can be stripped only to a limited extent, or not at all, are worth still less. Blacks, navy blues, oxford greys, and dark browns, if they cannot be stripped, bring the lowest price.

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While the clips and rags are sorted according to type and color, and to some extent ease of stripping, obviously such a heterogeneous collection of fabrics will contain many different dyestuffs. All of these dyestuffs will not strip to the same shade. By means of picking, garnetting, and carding, an average blended shade is produced. The greater the quantity of light colored clips and the less the quantity of dark clips, the lighter will be the aggregate blend and the greater premium in price it will command.

It is important that in stripping color from wool the fiber be injured as little as possible. Care must be taken not to make the fiber harsh and brittle. In many cases, the wool could be more completely stripped with a higher concentration of stripping agent and for a longer time. However, the "hand" and strength of the fiber limits such a procedure so that a darker shade must be accepted if the wool is to be used at all.

No figures are at hand as to what percentage of the 100 million pounds of reprocessed and re-used wool used annually is stripped. However, since up to the present there has been no known method of satisfactorily stripping (without damage) wool dyed with indigo and other vat colors, certain chrome colors, etc., probably a much greater amount of wool would be stripped if it could be done successfully,

With the exception of stripping light acid colors wherein low concentrations of commercially available stripping agents are used at the boil for periods of not more than ten minutes, some harshness and loss in fiber strength and elongation usually results. Therefore, in addition to there being a place for a better color removing process, there is also a demand for one which results in less damage to the fiber during the course of the strip.

Recent developments in wool chemistry†† have indicated that improved strength, stability, and "hand" are accomplished by introducing a wool modifying reagent into the stripping bath. However, it is not known whether such a technique effects more complete color removal when stripping vat and chrome colors.

II—Description of Commercially Available Stripping Agents

Sensitivity to strong oxidizing agents precludes the use of these materials in stripping color from wool. It is well known that the color of dyestuffs is due to chromophoric groups which are usually unsaturated structures. These chromophores may be either destroyed or reduced to their leuco bases by hydrogenation, i.e.: by means of powerful reducing agents. Due to the possibility of alkaline damage to the wool, such reducing agents are usually employed either at the neutral point or on the acid side.

* Presented at Intersectional Contest, Chicago National Convention, October 25, 1947.

** World Almanac, 1947.

† American Wool Handbook.

†† M. Harris and A. E. Brown—Am. Dyestuff Reporter, Vol. 36, No. 12. P. 316. 1947.

Commercially available stripping agents are few in number and fall into two classifications:

A. (1) Zinc Sulfoxylate Formaldehyde $Zn(SO_2HCH_2O)_2$
   (2) Basic Zinc Sulfoxylate Formaldehyde $Zn\ OH(SO_2H\ CH_2O)$
   (3) Sodium Sulfoxylate Formaldehyde $NaHSO_2CH_2O{\cdot}2H_2O$
   (4) Zinc Hydrosulfite ZnS_2O_4

B. (1) Titanous Sulfate $Ti_2(SO_4)_3$
   (2) Titanous Chloride $TiCl_3$

A typical strip using zinc sulfoxylate formaldehyde is as follows.

The strip is carried out in an open tub or kettle, heat being furnished either by an open or closed steam coil. Usually provision is made for keeping the stock agitated and the stripping liquor circulated to insure uniform stripping. To remove as much loose color as possible, the stock is given a 10-minute preboil with 1-6% ammonia (based on the weight of the stock) and a 40:1 "bath ratio"—i.e.: 40 parts by weight of liquid to one part of cloth. After the ammonia boil, the stock is drained and thoroughly washed. Again using a 40:1 bath ratio, 4-8% of sulfoxylate (based on the weight of the goods) is introduced into the tub. The pH is adjusted with acetic or formic acid to pH 3.2-3.5, the solution brought to the boil, and boiled for 10 to 40 minutes, depending upon the ease of stripping. Draining and thorough washing follows. Eight percent sulfoxylate for 40 minutes is about the maximum concentration and time which is used. If stripping is not accomplished under these conditions, the stock probably will not strip. If higher concentrations and longer times are used, the stock becomes boardy and unsatisfactory.

The industry uses a relatively small amount of titanous sulfate compared to the amount of sulfoxylate consumed. This is partly because titanous sulfate stripped wool is also harsh, and partly because this stripper is considerably more expensive than sulfoxylate. In using titanous sulfate, the same ammonia preboil described for the sulfoxylate may be used. A representative commercial titanous sulfate liquid strip is used at a concentration of 4 to 8% by volume (based on the amount of total solution), and a 40:1 bath ratio. Stripping is carried out at the boil for ½ hour, after which the stock is drained and thoroughly washed.

III—Disadvantages of Presently Available Commercial Stripping Agents

From the practical point of view and as was pointed out above, the two main disadvantages to the sulfoxylates are:

1—They will not strip most vat and chrome colors;

2—They leave the goods harsh and boardy.

A third disadvantage is the objectionable odor of sulfoxylate stripped wool.

Apparently sulfoxylates are insufficiently powerful reducing agents to destroy the complex coordination compounds of dyestuff-chromium-wool which probably are formed when wool is chrome dyed. In the case of vat colors, undoubtedly the sulfoxylates merely reduce them to their leuco forms which reoxidize when they are removed from the stripping bath.

The reason for the harshness is not definitely known. However, Harris* attributes damage caused by the use of the sulfoxylate type of reducing agent to the rupture of disulfide linkages in the wool.

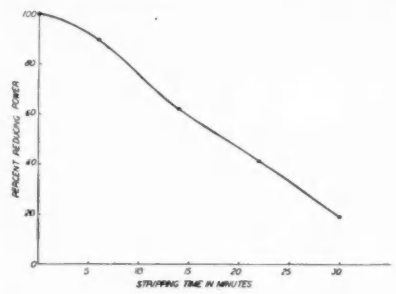
Titanous sulfate is excellent insofar as its ability to remove color is concerned. During the time that the titanous ion is reducing the dyestuff, it is itself being oxidized to the higher valence titanic state. The titanic sulfate so formed is unstable and hydrolizes to titanium dioxide. This insoluble pigment is precipitated on the fibers and contributes in part to their harsh hand.

Whether at the concentration required to strip the color, titanous sulfate *per se* renders the wool harsh by breaking S-S linkages has not been definitely ascertained. In the electrolytic process described below, using titanous sulfate as an electrolyte and stripping agent, wool with a soft hand is produced. This is undoubtedly due, in part, to the fact that continued electrolytic reduction of the titanous sulfate solution during the strip prevents the formation of appreciable quantities of titanic sulfate with accompanying conversion to the dioxide. Microscopic examination of fibers shows no precipitated TiO_2, thus supporting this point.

IV—Advantages of Maintaining Constant Stripping Power

If the sulfoxylate or titanous sulfate stripping agents described in Section II are titrated with standard potassium permanganate, their concentrations as reducing agents may be evaluated. With either of these strippers the reducing power must necessarily diminish during the course of the strip.

Graph 1 shows how the reducing power of a representative 8% sulfoxylate strip diminishes with time. With heavily dyed fabrics or with colors difficult to strip, as the stripping power diminishes continued boiling becomes progressively less effective. When it is evident that such a condition exists there is no alternative but to add more sulfoxylate to the bath. Thus in commercial practice, the total amount of sulfoxylate used may be 10% or more. The risk of damaging the wool becomes correspondingly greater.



Graph 1
Reducing Power of Zinc Sulfoxylate Formaldehyde Solution vs. Stripping Time.

Worsted Fabric Dyed with 3% Naphthalene Green B Stripped with 8% Zinc Sulfoxylate Formaldehyde at the Boil.

Since a stoichiometric relationship exists between the stripper (reducing agent) and the dyestuff (oxidizing agent), the practice of calculating the amount of stripping agent as a percentage of the weight of stock is not a logical one. The calculation should be based on the amount of dyestuff to be reduced.

Such a calculation is obviously impracticable since any number of unknown dyestuffs in unknown quantities may be found in one lot of stock. Since the quantity or type of dyestuff is not known the amount of stripping agent is determined by trial or guess work which may produce harsh and weak fiber.

By the electrolytic process a constant amount of reducing power is maintained, the concentration variable being eliminated. Equal reducing power per unit time is available for all dyestuffs and for all shades. It is the length of stripping time which is the variable adjusted to suit the particular stock being stripped. It is safe to employ such a constant reducing power-variable time technique because as long as the stripping time does not exceed 90 minutes, no harshening and only slight tensile strength loss results. Most colors which are strippable by this process will strip in this length of time.

V—An Electrolytic Process for Regenerating Stripping Solutions

Based on the fact that zinc sulfoxylate formaldehyde is incapable of stripping many colors, it is not worthwhile to consider re-reducing and re-energizing sulfoxylate solutions in order to maintain a constant reducing power during the course of a strip. Indeed, no method is known to

* M. Harris and A. E. Brown, American Dyestuff Reporter, Vol. 36, No. 12, P. 317, 1947.

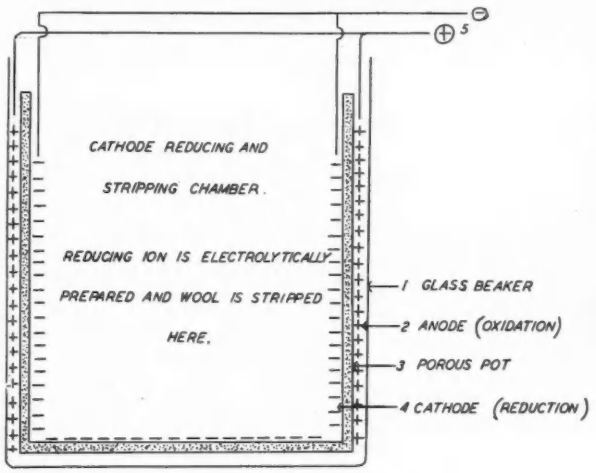
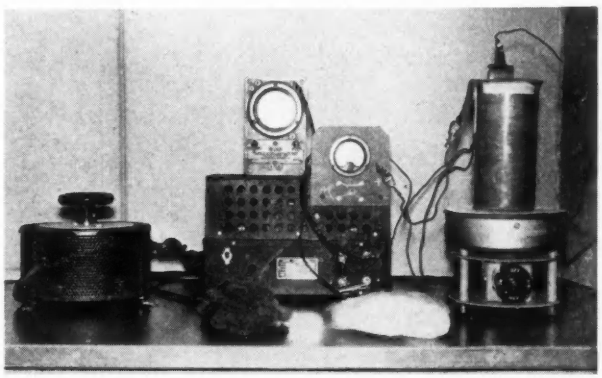


Figure 1.
Batch Type Electrolytic Stripping Cell.



Photograph 1.
Batch Type Electrolytic Stripping Cell.

accomplish such a purpose.

Titanous sulfate strips satisfactorily and also offers the opportunity of being re-reduced by electrolytic means during the course of a strip. Such a procedure offers three distinct advantages:

1—A constant level of reducing power is maintained throughout the duration of the strip.

2—Continuous reduction of the solution by electrolysis throughout the duration of the strip keeps the concentration of titanic sulfate and titanium dioxide at a minimum.

3—The reagent may be continuously and repeatedly used, thus appreciably reducing cost.

The Chemistry of Electrolytic Stripping Solutions:

The titanium ion has 3 valence states: +2, +3 and +4. The +2 state is completely unstable in air; the chloride $TiCl_2$, for example, may be prepared with great difficulty in an inert atmosphere as a dry solid. The +3 lavender state is the commonly called titanous ion used as a stripping agent. Since titanous sulfate is such a powerful reducing agent, it is easily subject to oxidation. However it has been stabilized and can be stored for limited lengths of time before use.

Titanous sulfate is usually prepared by reacting titanic sulfate with zinc:

$$2\ Ti(SO_4)_2 + Zn \longrightarrow Zn\ SO_4 + Ti_2(SO_4)_3$$

Section VI will describe its electrolytic manufacture and use. The advantages of such a process have already been listed above.

The titanic +4 ion is usually unstable in water solution, hydrolysis to the dioxide occurring.

Investigation of the literature and examination of the periodic table shows that chromium and vanadium are similar to titanium in that they too are multivalent elements and that their ions in the lower valence states are among the most powerful water soluble reducing agents known.

Chromium has 3 valence states: +2, +3, +6. The +6 and +3 states are stable to air. Green chromic salts (+3) are not sufficiently powerful reducing agents to strip most dyestuffs. The bright blue chromous (+2) ion *is* sufficiently powerful. It is so easily oxidized by air that it has not yet been prepared and stabilized as is the case with titanous sulfate. Thus chromous sulfate has not been obtainable as a commercial stripping agent. It must of necessity be made, used, and regenerated as needed.

Vanadium is similar to chromium in its oxidation reduction properties. This element has 4 valence states: +2, +3, +4, +5. The lavender valence (+2) and the blue valence (+3) are powerful reducing agents, particularly the former. The green (+4) and yellow (+5) valences are stable to air.

An additional advantage of chromous and vanadous sulfate is that in their oxidized condition they do not hydrolize to oxides insoluble in dilute sulfuric acid as does titanium. Thus no harsh hand results from precipitation of insoluble oxides. (It is reiterated that by the electrolytic process, precipitation of titanium dioxide is kept at a negligible minimum.)

Thus, electrolytically prepared and regenerated titanous, chromous, or vanadous sulfate may be used with equal success as stripping agents for wool. It is this electrolytic stripping process which is the subject of this paper*.

*Patent applied for.

VI—Description and Operation of Batch Type Electrolytic Stripping Cell

The laboratory electrolytic cell employed for preparing and using titanous, chromous or vanadous sulfate is one of classical electrochemical design. Figure 1 is a schematic drawing showing its construction. The apparatus comprises an outer glass beaker (1). Within the beaker (1) is a porous pot (3) open at its upper end. A metal sheet anode (2) in the form of a cylinder open at both ends is disposed within the outer glass beaker (1) and on the outside of the porous pot (3). A metal cathode (4) is disposed inside the porous pot closely adjacent to its cylindrical wall. This cathode is in the form of an open ended cylinder and is perforated to allow the stripping liquor to circulate freely. The cathode and anode are respectively connected to a suitable source of direct current (5). Photograph 1 shows the cell and the direct current source.

A solution of vanadium sulfate, prepared by dissolving vanadium pentoxide in dilute sulfuric acid, is poured into the cathode pot portion of the cell. Diffusion through the porous pot (3) eventually fills the anode portion, or to save time, the anode portion may be filled at the same time with the same solution.

A direct current potential is imposed across the electrode whereupon reduction occurs at the cathode, thus producing vanadous sulfate. Since vanadium sulfate is used as the electrolyte, the only reaction occurring at the anode is the evolution of oxygen. The current density is adjusted so that a minimum amount of hydrogen is evolved since the generation of molecular hydrogen has no major role in the stripping process. The entire electrolytic cell is kept at a temperature of 180-

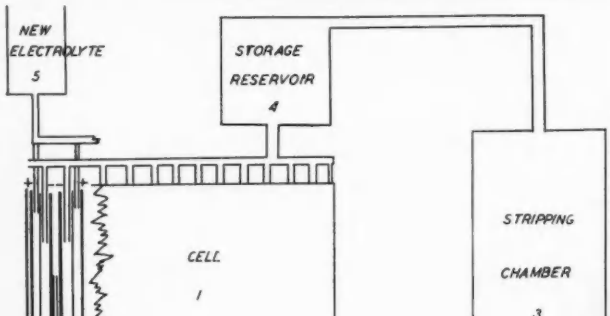
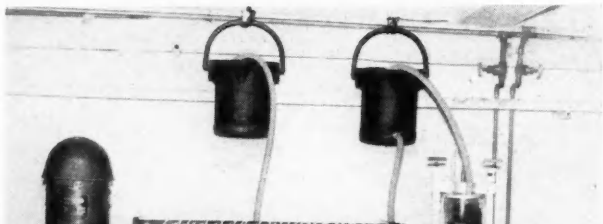


Figure 2.
Circulating Type Electrolytic Stripping Apparatus.



Photograph 2.
Circulating Type Electrolytic Stripping Cell.

190° F. As reduction proceeds, the clear yellow vanadic sulfate is progressively reduced through the blue vanadium valence 3 stage to the lavender valence 2 state.

The following equations show the sequence of chemical reactions:

A—Preparation of Vanadic Sulfate

(1) $V_2O_5 + 5H_2SO_4 \longrightarrow V_2(SO_4)_5 + 5H_2O$

B—Reduction at the Cathode

(2) $V_2(SO_4)_5 \longrightarrow 2V^{+5} + 5SO_4^{-2}$

(3) $2V^{+5} + 6\ominus \longrightarrow 2V^{+3}$

(4) $H_2O \longrightarrow H^+ + OH^-$

(5) $H^+ + \ominus \longrightarrow \frac{1}{2}H_2\uparrow$

C—Oxidation at the Anode

(6) $7H_2O \longrightarrow 7H^+ + 7\ OH^-$

(7) $7OH^- \longrightarrow 7/2\ H_2O + 7/4\ O_2 + 7\ominus$

It is the lavender vanadous ion which is the effective stripping agent. Reduction is accomplished in about one hour, after which anywhere from 1 to 10 batches of stock may be successively stripped. The cell, of course, is continuously operated so that vanadous sulfate is continuously regenerated during the strip in order to maintain constant reducing power. Make-up vanadic sulfate to compensate for the vanadous sulfate lost with the cloth when a stripped sample is removed from the cell is added at the anode. The number of batches which can be stripped is a function of the amount of reduced and destroyed dye produced by the stripped goods. This contaminates the stripping agent and eventually inhibits the reaction. In the case of dark blue indigos, for example, the stripping solution is contaminated at the end of two or three strips. For easily stripped acid colors, ten batches can easily be stripped.

The following procedure is used to strip wool: The stock may be given an ammonia preboil to remove loose color as in the sulfoxylate process. It is not necessary to do so, however. Since vanadous, chromous, and titanous sulfates are all acidic, it is important that the stock be made neutral after an ammonia or sal soda preboil, if one is used. The stock is introduced into the cathode chamber and stirred to insure uniform stripping. It has been found that many wetting and penetrating agents increase the speed of stripping and improve the shade. The wetting agent selected must, of course, be stable to the acidic reducing agent. When stripping has been effected, the stock is removed, rinsed thoroughly in water and is dried.

Easily stripped dyes—such as acid colors—require 5 to 20 minutes. Chrome colors may take from 20 minutes to 90 minutes. Indigo and vats usually require from 60 to 90 minutes. Dyestuffs which do not strip in 90 minutes will not strip by this process. The only dye so far encountered which will not strip at all is Alizarin Black WR.

VII—Description and Operation of a Circulating Type Electrolytic Stripping Cell

For large scale commercial operation, the batch pot-type cell is inconvenient and impractical for the following reasons:

1—The production of vanadous sulfate is a function of the amount of electrode surface. In the laboratory, the cathode pot is 2½ inches in diameter and 5½ inches high. If a large scale commercial cell of the same proportions were built, the ratio of electrode surface to volume would be enormously reduced. Thus, the production of vandadous sulfate would be proportionately lowered.

2—A second disadvantage is the problem of building such a cell. To build a porous pot diaphragm of such large proportion would be difficult and expensive.

3—When wool is stripped in the same pot containing the cathode, fibers may collect on the electrode, reducing the efficiency.

4—The problem of loading the pot cell with stock and removing it at the end of a strip interferes with the operation of the cell. Highest efficiency is attained when the cell is allowed to run continuously without shutting down while stock is entered or removed.

5—The danger of hydrogen generated in the same room where the wool is being stripped is obvious.

For the above reasons, it was advisable to design a unit wherein the electrolytic cell producing the stripping agent is entirely separated from the chamber where the wool is stripped. The stripping agent is made in an entirely different type of cell, is continuously pumped to the stripping chamber and is then returned to the cell where the oxidized vanadous, chromous or titanous ions are again reduced.

By so conducting the stripping, mechanical interference with the electrodes by the wool which is undergoing processing is avoided. The hydrogen and oxygen gases liberated from the cathode and anode can be disposed of more readily, and the cell may be located, for example, in a separate room. The design of the cell is not limited by the need to provide a space for the reception of the wool, and a more efficient and compact cell thus may be employed. Further, better circulation of the stripping liquor through the wool is ob-

tained and rinsing of stripping liquor from the wool at the end of the strip is facilitated.

Figure 2 is a diagrammatic sketch of the circulating cell and chamber. The apparatus consists of a "storage battery" plate-separator type of electrolytic cell (1), a pump (2) to force the stripping solution from the cell to the stripping chamber (3), a reservoir (4) for storing spent stripping agent which has been pumped from the stripping chamber and which will be returned to the cathode portions of the cell for regeneration, a reservoir (5) for storing new unreduced stripping agent (in the oxidized condition) which is piped into the anodes and which eventually diffuses into the cathode area where it, too, is reduced.

The wool is kept entirely separated from the cell, filters being provided to prevent any fiber from contaminating the cell. Additional valves, piping, rinse lines, and drains, not shown in the diagram, may be provided to expedite production.

Photograph 2 shows the pilot apparatus just described.

VIII—Color Comparison of Samples Stripped Electrolytically with Counterparts Stripped with Zinc Sulfoxylate Formaldehyde

Woolen or worsted fabrics were dyed with the dyestuffs listed below, after which each fabric was cut into four pieces and treated as follows:

1—Retained as a dyed "original".

2—Stripped at the boil with zinc sulfoxylate formaldehyde.

3—Stripped by the electrolytic process, using vanadous sulfate stripping agent.

4—Stripped by the electrolytic process, using vanadous sulfate stripping agent and then redyeing with representative wool dyestuffs.

Table I describes the dyeings, and the time, temperature, and concentration of the stripping procedure. Success or failure of the stripping and redyeing is indicated.

The problem of quantitatively measuring the "hand" of a fabric is decidedly complex and undoubtedly involves the interaction of such physical properties as stiffness in bending, softness and resilience in compression, coefficient of friction, heat conductivity and moisture transmission. No attempt has yet been made quantitatively to compare the "hand" of the sulfoxylate and electrolytically stripped fabrics. Tactile evaluation has been the criterion used in the above table. Broadly speaking, it is evident that, at concentrations above 8% for times greater than 40 minutes, sulfoxylate-stripped samples become so harsh and boardy as to be unacceptable. For the sulfoxylate samples listed in Table 1, if color removal were not obtained under these conditions, no additional attempt to strip was made.

In the case of the electrolytically stripped samples, no harshness or boardiness is evident even after 90 minutes of stripping treatment. It has been found that this length of time is about the limit beyond which it is useless to go. No additional stripping is obtained by further treatment. Additional treating time does not appear to make the wool harsh, but tensile strength begins to diminish appreciably.

In comparing the "hand" of fabrics stripped by the two methods, it is concluded that the electrolytic process produces by far the better result.

Let us now discuss the efficiency of color removal for each of the representative dyestuffs listed in the Table.

Naphthalene Green B is an acid color easily stripped by either process with equal ease and satisfaction. The electrolytic sample has a slightly better hand.

Eriochrome Red B is a chrome color impossible to strip with sulfoxylate. The electrolytic method produces a light tan shade in 50 minutes. Here is excellent evidence of the advantages of the electrolytic process.

Alizarin Saphirole B is an acid color which acts substantially like Erichrome Red B.

Wool Fast Blue G.L. is an acid color which, at first observance, appears to strip quickly and completely with sulfoxylate. However, upon removal from the stripping bath and rinsing, the dye immediately re-oxidizes to substantially the original blue shade. The sulfoxylate has not destroyed this dye but has only converted it to a leuco condition. The electrolytic process encounters the same problem of reoxidation if the fabric is removed from the strip bath after 20 minutes. However, prolonged reduction destroys the major portion of the dyestuff and the color "comeback" is small. Possibly, if the sulfoxylate stripping could be continued for a longer time and if the concentration of sulfoxylate could be kept at its original value during this time, most of the dye would be destroyed and would not come back. However, such a treatment produces too harsh a fabric.

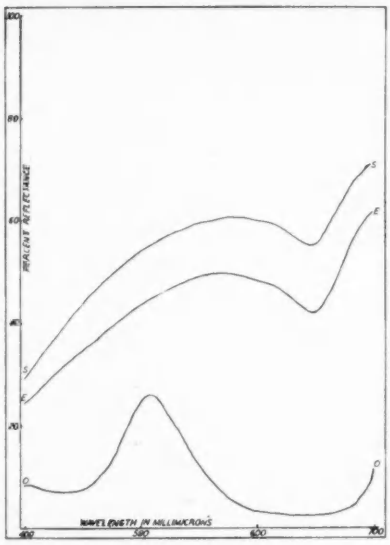
Curves of Napthalene Green B, Chromacyl Orange R, the Acid Brown, and the Metallized Blue-Grey all indicate that both the sulfoxylates and the electrolytic method produce equally satisfactory results. For the former two the sulfoxylate is slightly better; for the latter two, the electrolytic method is better.

The spectrophotometer of course distinguishes between samples unsuccessfully stripped by sulfoxylate and successfully stripped by the electrolytic process.

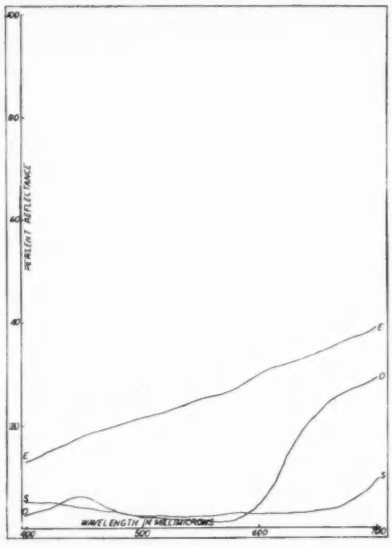
TABLE I

Color Comparison of Samples Stripped Electrolytically with Counterparts Stripped With Zinc Sulfoxylate Formaldehyde

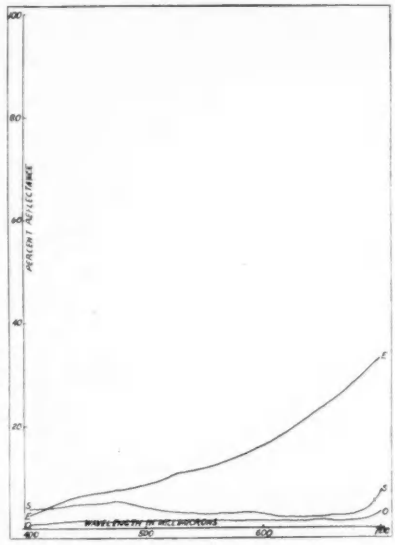
			Sulfoxylate Strip				Electrolytic Strip		
Dyeing	*Colour Index*	*Dye Type*	*Time*	*Conc.*	*Color Removal*	*Hand*	*Time*	*Color Removal*	*Hand*
3% Naphthalene Green B	735	Acid	10 min.	4%	Excellent	Good	25 min.	Excellent	Excellent
Eriochrome Red B.....	652	Chrome	30 min.	8%	Failure	Good	50 min.	Very Good	Excellent
3% Alizarine Saphirole B	1054	Acid	30 min.	8%	Failure	Fair	75 min.	Very Good	Excellent
¼% Wool Fast Blue G.L.	833	Acid	40 min.	8%	Failure	Poor	45 min.	Very Good	Excellent
Indigo	1177	Vat	40 min.	8%	Very Poor	Fair	90 min.	Good	Excellent
3% Acid Rhodamine G...	752	Phthalic Anhydride	30 min.	8%	Failure	Poor	90 min.	Good	Excellent
Alizarine Brown R.....	1035	Chrome	30 min.	8%	Very Poor	Poor	80 min.	Good	Excellent
Chromacyl Orange R,....	Dupont Pr 146	Metallized	10 min.	4%	Excellent	Excellent	15 min.	Excellent	Excellent
Alizarine Black WR....	1019	.....	40 min.	8%	Failure	Good	75 min.	Failure	Excellent
Representative Mill Dyeings									
Acid Brown	....	Acid	30 min.	8%	Excellent	Fair	15 min.	Excellent	Excellent
Chrome Blue	....	Chrome	30 min.	8%	Failure	Fair	90 min.	Fair	Excellent
Metallized Blue-Grey ...	....	Metallized	30 min.	4% + 4%	Good	Good	10 min.	Excellent	Excellent



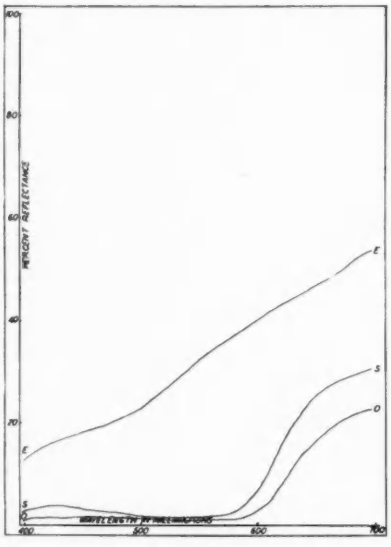
Graph 2.
3% Naphthalene Green B.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



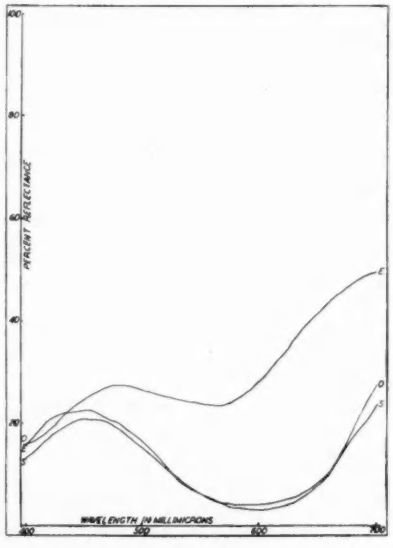
Graph 4.
Alizarin Saphirol B.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



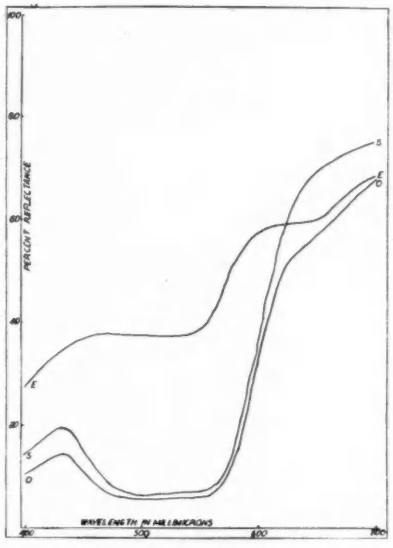
Graph 6.
Indigo.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



Graph 3.
Eriochrome Red RB.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



Graph 5.
Pontacyl Wool Blue GL.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.

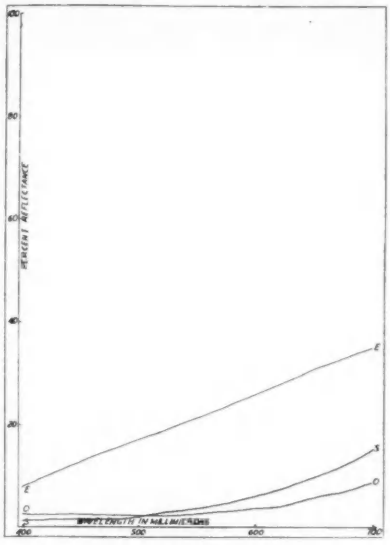


Graph 7.
3% Acid Rhodamine G.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.

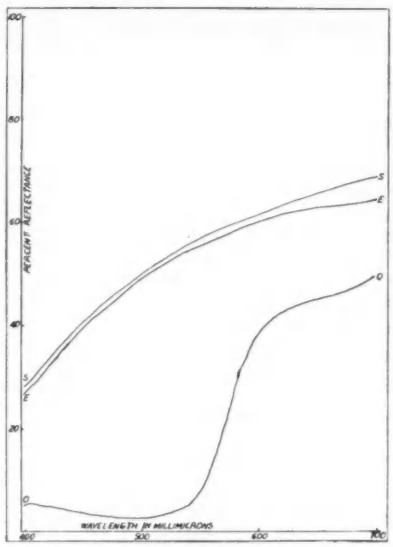
IX—Redying Properties of Electrolytically Stripped Fabrics

Generally speaking, it may be stated that wool stripped by the electrolytic process may be satisfactorily redyed by usual procedures with no difficulty. No added precautions or techniques are required.

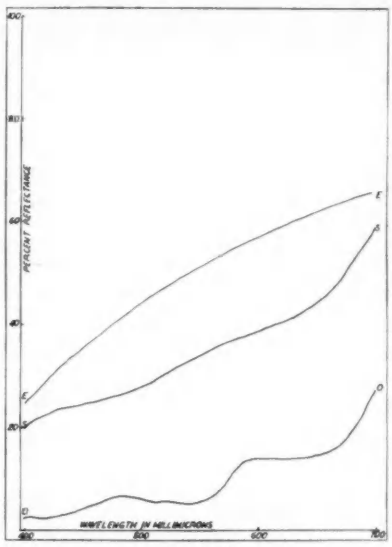
Table II lists samples which were stripped electrolytically and were then redyed with representative dyestuffs for wool. In addition to the successful redyeing, the resulting "hand" of the fabrics remains excellent.



Graph 8.
Alizarin Brown R
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



Graph 9.
Chromacyl Orange R.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



Graph 10
Acid Dyed Brown.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.

TABLE II

Redyeing Properties of Electrolytically Stripped Samples

Original Dyeing	*Redyeing*	*Colour Index*	*Dye Type*	*Redyeing Property*	*Hand*
3% Naphthalene Green B	A. 1% Eriochrome Brilliant Violet B	53	Chrome	Good	Excellent
Eriochrome Red B	A. 2% Fast Acid Red J.R.	....	Acid	Good	Excellent
3% Alizarine Saphirole B	A. Fast Crimson 6BL	57	Acid	Excellent	Excellent
	B. Eriochrome Red B	652	Chrome	Fair	Excellent
¼% Wool Fast Blue G.L.	A. 1% Patent Blue AF	673	Acid	Good	Excellent
Indigo	A. 2% Alkali Fast Green 2G	735	Acid	Good	Excellent
	B. 2% Chrome Green BY	....	Chrome	Good	Excellent
3% Acid Rhodamine G	A. 2% Acid Orange Y	151	Acid	Good	Excellent
	B. 2% Chromaven Milling Orange G	274	Chrome	Fair	Excellent
Alizarine Brown R	A. 1% Alkali Fast Green 2G	735	Acid	Excellent	Excellent
	B. 1% Alizarine Cyanine Green 2G	1078	Chrome	Good	Excellent
Chromacyl Orange R	A. 1% Fast Lt. Yellow 2GX	....	Acid	Excellent	Excellent
	B. 1% Eriochrome Flavine A	219	Chrome	Good	Excellent
Representative Mill Dyeings					
Acid Brown	A. 2% Brill. Scarlet 3R	185	Acid	Excellent	Excellent
	B. 2% Superchrome Red B	216	Chrome	Excellent	Excellent
Chrome Blue	A. 3% Acid Brown SMC	....	Acid	Good	Excellent
Metallized Blue-Grey	A. 4% Acid Blue BRD	....	Acid	Good	Excellent

Graphs 13-23 are spectrophotometric curves showing electrolytically stripped samples redyed with acid and/or chrome colors. As a "redye control" a piece of new white woolen cloth* was dyed with the exact same color and formula. Thus the effect of the color of the stripped sample on redyeing may be noted.

The color of a stripped sample controls the color to which it may be redyed. It is apparent that colors which are easily stripped to a light shade will, upon redyeing, more closely match a "redye control". Greater differences are produced when stripped chrome and vat colors are redyed and compared with the "redye control."

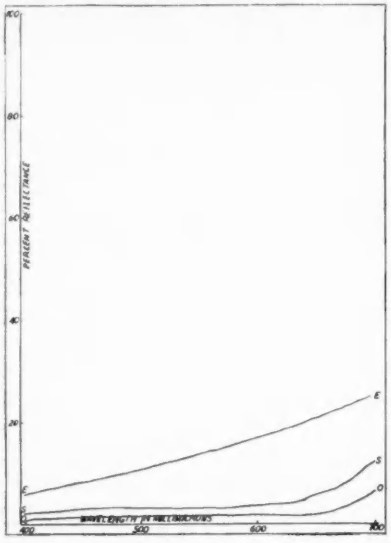
No attempt was made to modify the dye formula whereby the electrolytically stripped samples were redyed to *match* the color of the "redye control". Obviously this would be possible in many but not all cases.

* Because of the many different types of woolen and worsted fabrics stripped, white redye controls for each were not obtainable. Instead one type of white woolen cloth was selected and used for all redye controls. Therefore color only, but not 'hand'' may be compared.

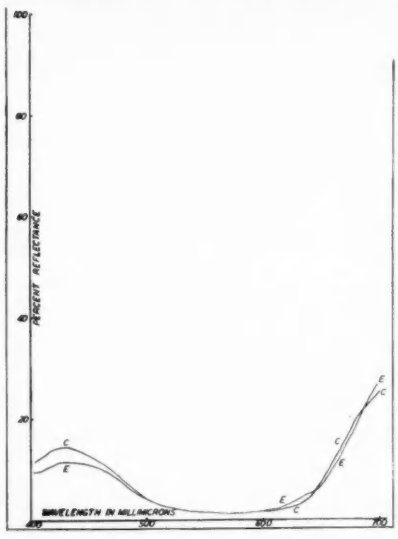
Note: In the case of the Naphthalene Green B redyed with 1% Eriochrome Brilliant Violet B, and the Metallized Blue-Grey redyed with 4% Acid Blue BRD, the redyed colors are much darker than necessary. Inspection of the spectrophotometric graphs (2 and 12) of the stripped fabrics will bear this out.

X — Comparison of Breaking Strength and Percent Elongation of Stripped Fabrics

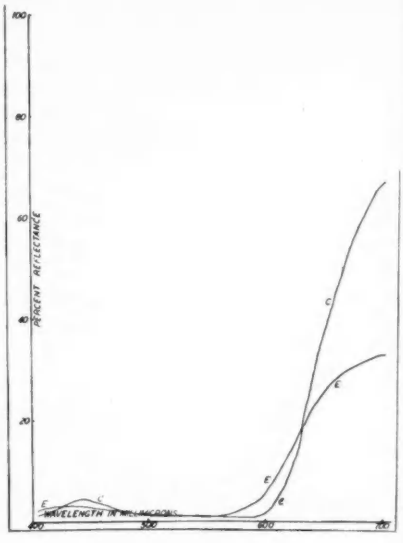
To determine the effect of the two methods of stripping on tensile strength and percent elongation, an undyed white wool fabric was selected and cut into 7" x 9" portions. A "Latin Square" statistical samp-



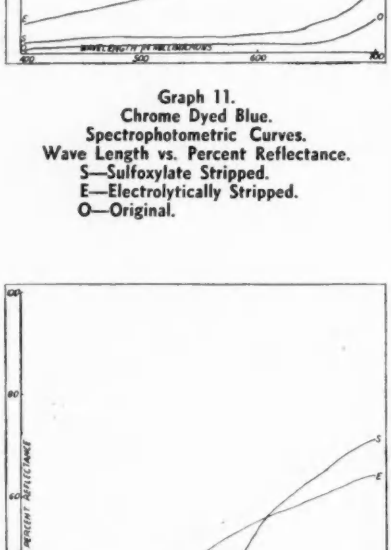
Graph 11.
Chrome Dyed Blue.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.



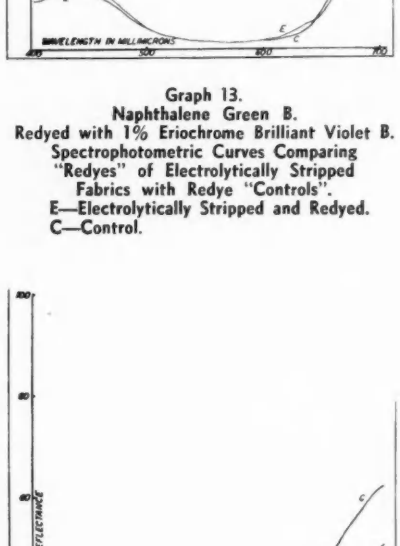
Graph 13.
Naphthalene Green B.
Redyed with 1% Eriochrome Brilliant Violet B.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



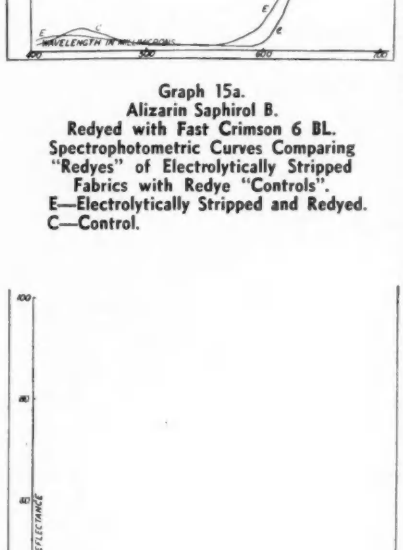
Graph 15a.
Alizarin Saphirol B.
Redyed with Fast Crimson 6 BL.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 12.
Metallized Blue Grey.
Spectrophotometric Curves.
Wave Length vs. Percent Reflectance.
S—Sulfoxylate Stripped.
E—Electrolytically Stripped.
O—Original.

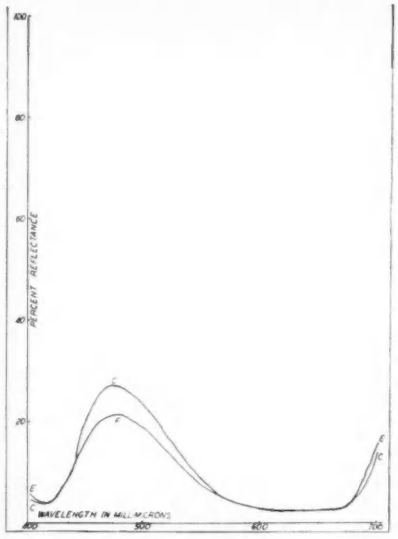


Graph 14.
Eriochrome Red B.
Redyed with 2% Fast Acid Red JR.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

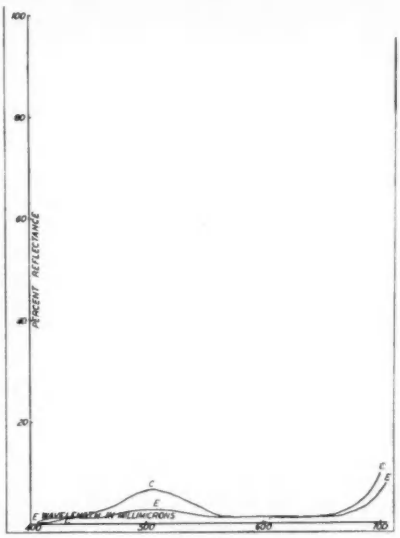


Graph 15b.
Alizarin Saphirol B.
Redyed with Eriochrome Red B.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

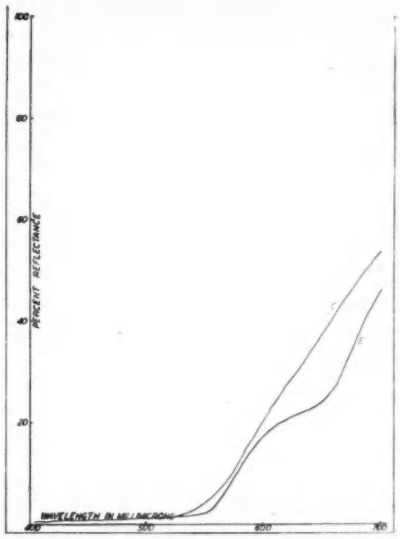
ling method was employed whereby control and treated test specimens in each case contained the same set of warp yarns. The controls were boiled in distilled water containing a wetting agent. The other samples were subjected to the action of the various stripping agents (also containing a wetting agent) in the usual manner, thoroughly washed, dried and conditioned at 65% R.H. and 70° F. before testing. From the 7″ x 9″ samples so prepared, conventional A.S.T.M. 6″ x 1¼″ revelled strip tensile specimens were cut. Breaking strengths were determined using a 50 pound capacity electric strain gage tester,



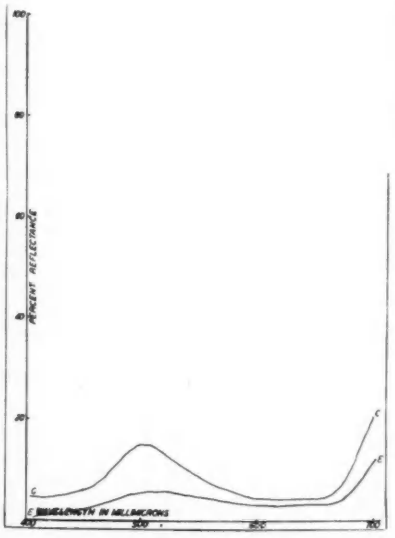
Graph 16.
Wool Fast Blue GL.
Redyed with 1% Patent Blue AF.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



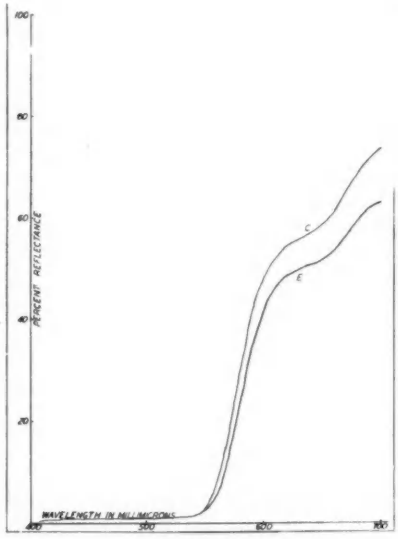
Graph 17b.
Indigo
Redyed with 2% Chrome Green BY.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



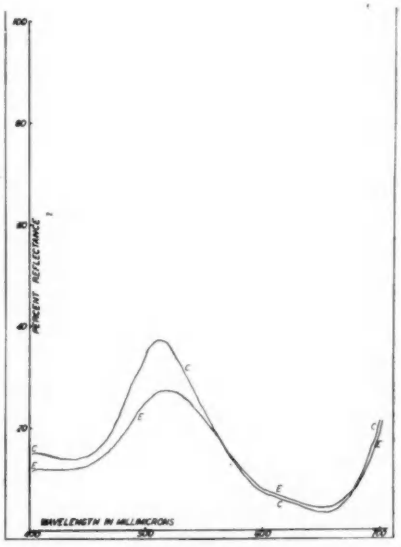
Graph 18b.
Acid Rhodamine G.
Redyed with 2% Chromaven Milling Orange G.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 17a.
Indigo.
Redyed with 2% Alkali Fast Green 2G.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 18a.
Acid Rhodamine G.
Redyed with 2% Acid Orange Y.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 19a.
Alizarin Brown R.
Redyed with 1% Alkali Fast Green 2G.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

a 3″ gage length and a pulling jaw speed of 6″ per minute. Two sets of samples were broken, one dry and the other wet. The decrease in wet strength is indicative of chemical damage. Table III gives the results of these tests.

Table IV normalizes the values in Table III with 100 for the controls as a base.

Discussion of Tables III and IV.

1—Dry Strength:

The control shows no reduction in strength over the 90 minute period. No statistically significant difference exists between the 18.1 lbs. and 19.4 lbs. sulfoxylate values at 20 and 40 minutes (Table III) or between the 18.1 lbs. and 16.8 lbs. values at 20 and 90 minutes. The differ-

TABLE III

Comparison of Breaking Strengths and Percent Elongations of Stripped Fabrics

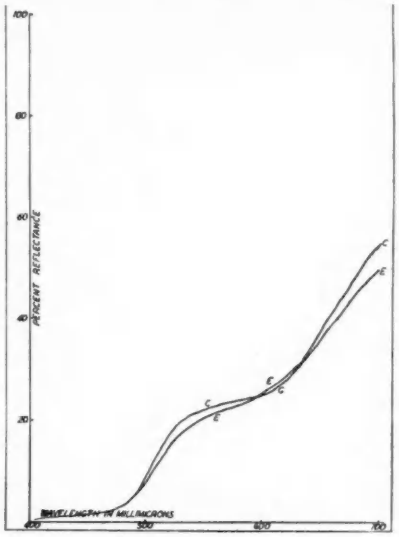
BREAKING STRENGTH (LBS.)

	DRY			WET		
Time of Treatment (min.)	*20*	*40*	*90*	*20*	*40*	*90*
Control	21.1	21.0	20.2	16.9	15.5	15.9
Zn SF	18.1	19.4	16.8	9.5	10.5	6.9
Electrolytic (Titanium)	19.8	19.0	15.4	14.1	12.7	7.4
Electrolytic (Chromium)	19.4	21.0	20.5	13.7	13.0	11.4
Electrolytic (Vanadium)	20.6	18.8	17.4	14.1	9.7	8.2
% ELONGATION						
Control	46.5	39.2	42.4	61.4	62.1	65.9
Zn SF	39.2	46.9	36.8	72.7	64.3	69.8
Electrolytic (Titanium)	50.0	43.4	38.3	70.6	66.7	56.0
Electrolytic (Chromium)	46.8	51.9	49.9	67.2	68.5	64.1
Electrolytic (Vanadium)	52.1	48.5	44.5	67.6	59.7	62.8

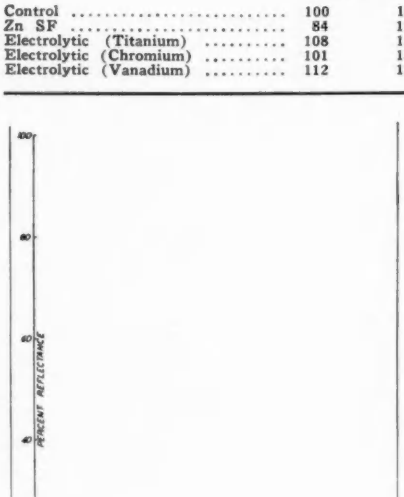
TABLE IV

BREAKING STRENGTH

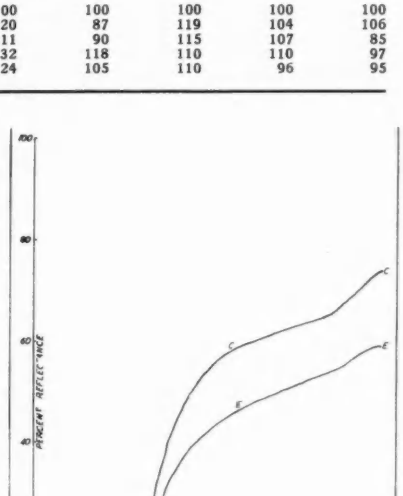
	DRY			WET		
Time of Treatment (min.)	*20*	*40*	*90*	*20*	*40*	*90*
Control	100	100	100	100	100	100
Zn SF	86	93	83	56	68	.43
Electrolytic (Titanium)	94	91	76	84	82	47
Electrolytic (Chromium)	92	100	101	81	84	72
Electrolytic (Vanadium)	98	90	86	83	63	52
ELONGATION						
Control	100	100	100	100	100	100
Zn SF	84	120	87	119	104	106
Electrolytic (Titanium)	108	111	90	115	107	85
Electrolytic (Chromium)	101	132	118	110	110	97
Electrolytic (Vanadium)	112	124	105	110	96	95



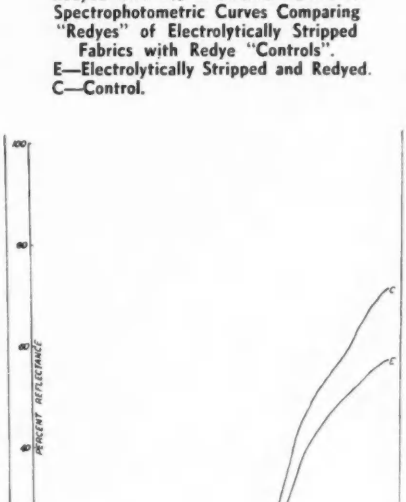
Graph 20b.
Chromacyl Orange R.
Redyed with 1% Erichrome Flavine A.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 19b.
Alizarin Brown R.
Redyed with 1% Alizarin Cyanine Green 2G.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

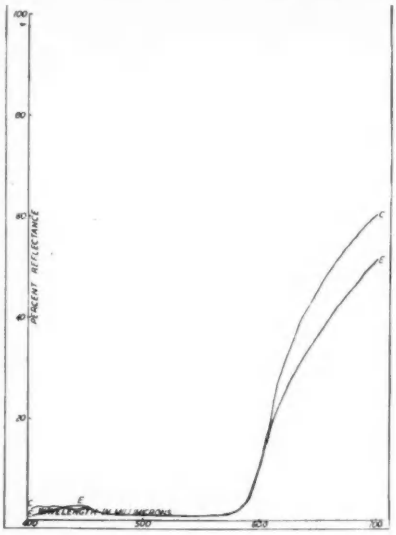


Graph 20a.
Chromacyl Orange R.
Redyed with 1% Fast Light Yellow 2 GX.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

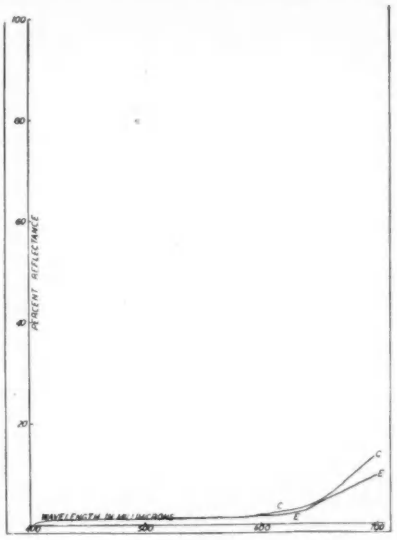


Graph 21a.
Acid Brown.
Redyed with 2% Brilliant Scarlet 3R.
Spectrophotometric Curves Comparing
"Redyes" of Electrolytically Stripped
Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

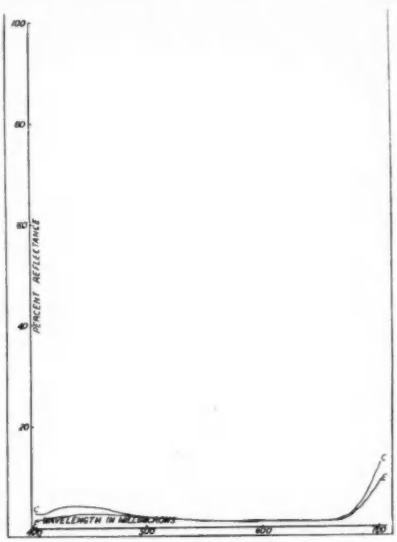
ence between 16.8 and 19.4 *is* significant. It would appear therefore that the sulfoxylate loses 14% in strength in 20 minutes after which there may be a slightly greater loss. It is important to point out that, according to Graph 1, less than 20% of the sulfoxylate's original reducing power is available after 30 minutes. Therefore it is logical to conclude that the sulfoxylate *as a reducing agent* has little effect on the strength after 40 minutes. Were the concentration of sulfoxylate kept constant over the 40 and 90 minute range, undoubtedly, further strength losses would have occurred.



Graph 21b.
Acid Brown.
Redyed with 2% Superchrome Red B.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 22.
Chrome Dyed Blue.
Redyed with 3% Acid Brown S.N.C.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.



Graph 23.
Metallized Blue Grey.
Redyed with 4% Acid Blue BRD.
Spectrophotometric Curves Comparing "Redyes" of Electrolytically Stripped Fabrics with Redye "Controls".
E—Electrolytically Stripped and Redyed.
C—Control.

At 20 minutes all three electrolytically stripped samples are stronger than the sulfoxylate, the average strength loss being about 5%. At 40 and 90 minutes the titanous and vanadous samples are of about the same strength as the sulfoxylate. Here again comparison is made between samples treated with a constant concentration and one wherein the reducing power of the solution becomes rapidly exhausted. The chromous samples are significantly stronger than the titanous or vanadous, being just as strong as the control. The difference in the action of this metal ion is being further investigated.

2—Dry Elongation:

Elongation values are highly variable and only trends can be shown. With the exception of the 40 minute value which appears to be anomalous, it would appear that sulfoxylate produces a less extensible and more brittle fiber. The electrolytic samples all have higher elongation than the controls. The 90 minute titanous value is also somewhat anomalous. It should be pointed out here that load elongation values for fabrics do not necessarily reflect similar values for fibers. The treatments employed might change fiber friction, state of aggregation, normal pressure between fibers, etc. All of these would change the fabric properties independent of change in fiber properties. However, considering the difficulties of testing single fibers, and the number of specimens required to obtain a satisfactory average because of the high variability, it was decided to run fabric tests first.

Of course, the determination of ultimate strength and elongation alone are not the only criteria by which the two processes should be compared. The load-elongation *diagram,* energy absorption, and the elastic and creep properties in repeated stress are of inestimable value, being related to wear resistance, for example. The dry elongation values reported here would indicate the possibility that the elastic properties of the electrolytically stripped samples are superior. Certainly the energy absorption values would be greater.

3—Wet Strength:

Wet strengths are of course appreciably lower than dry strengths. Sulfoxylate stripped samples lose almost half of their wet strength in the first 20 minutes. After that time, because of the exhaustion of the solution, the rate of additional strength loss diminishes. The electrolytically stripped samples lost approximately 15% in 20 minutes. It requires 90 minutes to produce 50% losses. Again the chromium appears to be outstandingly better. There exists the possibility that it acts as a cross linking agent which stabilizes the wool, thus producing both the higher wet and dry strengths. Further investigation is necessary on this phase of the work.

Table V shows the ratio of wet to dry strengths. Here is an effective method for comparing the stripping methods. The wet controls are approximately 80% as strong as the dry. The sulfoxylates are only 50% as strong at 20-40 minutes, and diminish to 40% at 90 minutes albeit the reagent is exhausted. The electrolytically stripped samples are 70% as strong at 20 minutes, in the order of magnitude of 50-65% at 40 minutes, and 50% at 90 minutes. The superiority of the electrolytic method is obvious.

4—Wet Elongation:

Values are of the same order of magnitude for all samples and no conclusions can be drawn.

TABLE V

Ratio of Wet to Dry Strengths

	20 Minutes	*40 Minutes*	*90 Minutes*
Control	80.0	74.0	79.0
Zn SF	52.5	54.0	41.0
Electrolytic (Titanium)	71.0	67.0	48.0
Electrolytic (Chromium)	71.0	62.0	61.0
Electrolytic (Vanadium)	68.5	51.5	47.0

XI—Cost of Electrolytic Stripping

Preliminary estimates from laboratory scale operation indicates a cost of 2 to 4 cents per pound of wool stripped, for chemicals and electricity only. This is based upon the premise that the electrolytic stripping solution is used 3 to 10 times and is then discarded, and that 60 minutes is required to strip a batch of wool.

In stripping with sulfoxylate the cost of the sulfoxylate alone amounts to 1½ to 3 cents per pound of wool stripped. This does not include the cost of acetic or formic acid used to adjust pH, or of any chemicals used in the preboil.

The corresponding cost of stripping with commercial titanous sulfate is considerably more than either of the above.

XII—Summary

A method is described for stripping color from dyed wool by an electrolytic process. This utilizes the continuous electrolysis of salts of such multivalent elements as titanium, chromium and vanadium.

The advantages of this process are:

1—Dyestuffs impossible or difficult to strip by present methods are successfully stripped.

2—The "hand" of wool so stripped is substantially as soft and resilient as unstripped wool.

3—Strength losses for woolen fabrics so stripped are under 8% for 20 minutes, under 10% for 40 minutes, and under 24% for 90 minutes. Increases in elongation up to 12% for 20 minutes, 32% for 40 minutes and 18% for 90 minutes are obtained.

4—No objectionable residual odor is noted.

5—Stripping is conducted below the boil.

6—No pre-scouring is necessary.

7—A constant level of reducing power is maintained throughout the duration of the strip.

8—Within practical limits the reagent may be continuously and repeatedly used, thus maintaining a low cost.

9—Samples so stripped may be satisfactorily redyed with light shades.

Acknowledgments

The authors are indebted to the following persons and organizations for their assistance, suggestions, and encouragement in preparing this paper.

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Goodall-Sanford, Inc.
Monsanto Chemical Company
Worsted Division, Pacific Mills
Sagamore Color and Chemical Company

—♦ ♦—

Detergents—

(Concluded from Page P113)

through loosening the oil and waxes present in the greige goods. During the rinse it is thus possible to cleanse the fibers and there is no waste of product. Carryover into the kier renders the product even more efficient.

The non-ionics exhibiting no deleterious effects on enzymes and showing high wetting efficiency at the temperature range of 120-160° F. are definitely the best choice in such baths. Concentration of 1 pound per 100 gallons gives the wetting and also the detergency against former use of the same money value to perform only wetting. Similarly during continuous peroxide bleaching wetting agents yield the place to detergents, providing the catalytic action on peroxide baths is nil; here again is a case for non-ionics.

Practical tests on millions of yards of rayon cloth run directly in the greige through a four volume cold peroxide-silicate bath using 0.1% detergent, rinsed after standing, gave scope for the assistant to utilize its scouring properties and eliminate the regular scouring operations.

The use of anionic synthetic detergents in the large capacity (8,000-10,000 gallons) boil-off tanks developed by the spun rayon finishing industry during the last few years, eliminates the use of a hard water corrective agent and pays its way for that alone without even considering the advantage of the long standing baths which are imperative in complicated machinery which necessitates long cleansing periods. The same considerations hold true for the progressive jigs recently developed for heavy fabrics. The new self-scouring oils used by the woolen industry already point the way to the future expansion of a field to which synthetic detergents contributed a great deal.

An attempt has been made here to stress the increasing complication of the textile industry and the necessity of careful selection of synthetic detergents used in the right way under the right conditions. Versatility of a product does not mean it does everything, so lets endeavor to carry the banner for better synthetics, greater specialization in new uses, and not attempt to expand against barriers which might prove insurmountable.

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Estimation of Vat Printing Paste—

(Concluded from Page P111)

Discussion

The methods of analysis described in this report, while not offering a direct means of dyestuff determination, may be useful in estimating the paste or the dyestuff on material printed with vat colors.

In the investigations conducted by this laboratory, the value of this work has been proven when uneven results have been obtained during aging of vat prints. Where shades have been below standard, it has been possible to determine the amount of sulfoxylate and see whether or not this has been up to standard.

Summary

A relatively simple and rapid method of analysis of vat print paste on cloth by the oxidative conversion of the sulfoxylate to sulfate has been presented in this paper. In addition, a method for analyzing printed cloth for the quality of active reducing agent present in the print has been described. Finally, determination of the active sulfoxylate in pastes containing strong colors has been made possible by the application of an electrometric procedure.

Acknowledgment

The writer wishes to thank E. W. Lawrence, in charge of the Laboratories of the Cranston Print Works Company, for his valuable assistance and for the opportunity to write this paper.

Bibliography

(1) Hall, P. C., Dow Chemical Co., private communication.

(2) Am. Dyestuff Reptr. *33*, P. 502 (1944).

(3) Mellon, M. G., "Colorimetry for Chemists", Chapter 5, published by the G. Frederick Smith Chemical Co., Columbus, Ohio, 1945.

(4) Stearns, E. I., Calco Technical Bulletin No. 756.

(5) Platner, W. S., Ind. Eng. Chem., Annl. Ed. *18*, 334 (1946).

(6) Kolthoff and Sandell, "Textbook of Quantitative Inorganic Analysis", Chaper XX, The MacMillan Co., New York, 1946, and other texts.

(7) Jellnick, O., "Das Hydrosulfit", Chapter II.

Cellulosic Fibers Group Meeting—

Unwoven Fabrics

Their Future in the Textile Industry

OLIVER G. EDWARDS
Industrial Research Institute,
University of Chattanooga
Chattanooga, Tennessee

FOR years the old beaten-up monarch, cotton, on which 13,500,000 people depend for their daily bread, has waged and is losing a great fight. Some are waiting for a miracle to come along and save the old king from further defeats; others are doing their best to aid in this struggle by solving old problems and by seeking new outlets for cotton through research.

It was not long after I entered the textile field, that I discovered the principal problems facing the textile industry. These problems dealt mainly with simplicity of processes, speeds of machinery, size of package, heavy cloth, light cloth, reedy cloth, uneven yarn, slubs and a hundred other things. The cotton textile industry was in need of sound thinking and good engineering. The synthetic yarn manufacturers, no doubt, had their problems, but through applied science and research they were delivering a good, even and uniform product. Cotton was not only being replaced by these superior synthetics but was also losing ground to inferior materials. For example: The paper industry, through research and the application of chemistry, had given us face tissue instead of cotton handkerchiefs, and paper towels instead of those made from cotton.

From demands brought on the cotton textile industry by competition, it was realized that a great amount of research and development was necessary. But in the beginning, most of these developments were confined to the synthetic fibers and their application to cotton mill machinery in yarns and fabrics of everyday life. Cotton, one of the most abundant of the natural fibers and one that had enjoyed a long and useful life in many applications, began to find itself in a peculiar position. Most of the cotton processing machinery was old, out-dated and not suitable to high speed production. However, some very serious thought was given and plans were made to improve equipment, investigate processes, and find new uses for this fiber. It was evident that the future of the cotton industry lay both in the development of high speed machinery and in the advancement of chemical application to the fibers. New uses, new products, and cheaper processes not known to the industry had to be found.

Unwoven fabric is one of the developments that came out of the industry-wide research program for cotton. However, this technique does not limit itself to cotton alone. Many unwoven fabrics are made from rayon and other fibers. These products are now on the market and are well known in the trade by such names as Masslinn, Plastavon, Steralon, Viskon, and Webril.

One of the oldest and best known unwoven fabrics is wool felt. This is an unwoven fabric composed basically of sheep's wool, in which the fibers are intertwined in all directions, thus utilizing the natural characteristics of the fiber and creating permanent bonding. Felting or interlocking is more apparent in carded stock which has been drawn out. The manufacture of this type of material consists essentially in agitating the carded stock while it is in a warm, moist condition, and simultaneously distributing the fibers uniformly and avoiding lumps and bunches This loosely constructed type of cloth is further processed in fulling mills while still in a rather closely controlled warm and moist condition. This increases the interlocking of the fibers, thereby forming a uniform type of cloth known as felt.

There are three basic processes for manufacturing nonwoven fabrics from nonwool fibers. These processes completely eliminate spinning and weaving. In one, a thin web of fibers comes from the carding machines in a wide sheet, with one or more sheets forming a "lap". This "lap" then undergoes a treating or bonding process that varies with the type of nonwoven fabric desired. The techniques and material used depend largely upon the end use to which the fabric will be put. The process using cards naturally aligns the fibers in such a manner that the strength is greater in the warp direction. This fabric should not be considered where a high cross strength is required. Realizing this drawback to the carded web fabrics, attention was turned toward finding ways of improvement, and a machine has been introduced for continuous cross-laying of the webs. This fabric has great strength and is suitable for many types of clothing such as work frocks, aprons, protective clothing, and bag material. Another process more or less distributes the fibers in a random fashion and gives a more even distribution of strength, which is very well demonstrated in the Pee Wee diaper. This fabric has strength about equal in all directions, and by necessity must be strong, soft, absorbent and capable of being pinned.

The drawn fibers or third process is used in fabrics requiring great strength and uniformity. The fibers are more parallel and tend to form a denser web than the heterogeneous formation of the carded fabric. Although it is somewhat more expensive than the other processes, it has the added possibilities of meeting more strenuous specifications. This fabric can replace woven fabrics in the coating industry and has many advantages. If the bonding agent selected in compatible with the final coating, the fabric becomes an integral part of the finished product. This eliminates blisters, separating, peeling, and elongations, and makes a better upholstery material for furniture and automobiles.

Many types of binders or bonding agents have been employed, among them starch, sulfuric acid, zinc chloride, polyvinyl alcohol, polyvinyl acetate, polyvinyl chloride, rubber latex, other synthetic resins and thermoplastic fibers. Ordinarily, the binders are colorless. However, coloring can be added to provide a decorative effect. In some cases the bonding agent is put in parallel or wavy lines in both warp and filling direction. In another it may be printed in round dots, diamond or square figures. Others may employ sprays or passing the web through a bath. Regardless of what processes is used to sup-

* Presented at the Cellulosic Fibers Group Meeting, George E. Osha, Presiding, National Convention, Chicago, October 24, 1947.

ply the bonding agent, all the fibers must be anchored at some point.

The fiber used in the web can be either raw, bleached or dyed, as desired. The dyestuff can be introduced with the bonding resin during manufacturing or the fabric can be successfully printed or piece dyed, much the same as woven fabrics. Unwoven fabrics can be delivered in stiff, soft, absorbent and non-absorbent finishes having specific outstanding characteristics. These fabrics dye and print well, the color being true and clear. They can be made water repellent, stain proof, and flame proof. In addition, a stiff finish may be embossed if desired for decorative purposes.

It must be remembered that nonwoven fabrics are relatively new and cannot be expected to serve in all places as well as woven cloth. Due to the low cost and high production, they should be able to receive satisfactory customer acceptance and fill the wide gap that exists between paper and woven cloth, although it should be emphasized that, in certain applications, unwoven cloth surpasses either paper or woven fabrics.

Unwoven fabrics are finding many uses in both household and industrial applications. The soft finishes drape well and are suitable for many purposes around the home, such as table cloths, napkins, handkerchiefs, curtains, towels, diapers, dish cloths, dusting cloths, polishing cloths, furniture cloths and many other disposal articles. In industry these materials are finding wide uses as industrial filters, coffee filters, tea bags, sausage casings, pipe coverings, coat interliners, and casket and handbag linings. It is also recommended in non-cracking wallpaper, backing for oil cloth, leatherette, buffing wheels, varnished electrical insulation fabrics, storage battery plate separators, optical polishing cloths and laminated fabrics.

The use of woven cloth in the plastic laminating industry is well known. In fact, it has enjoyed a very popular position, having grown to a production of around eighty million pounds annually within the past six or seven years. However, the high cost of spinning and weaving has made the introduction of unwoven fabrics much easier in this field. This does not mean that less textiles will be used, but that a great deal more will be consumed because of their low cost, superior qualities and engineered application to a specific use.

Nonwoven cloth is one of the new materials that is attracting special attention today. Many improvements and many materials have been perfected during the past few years and all of these will be called to the engineer's attention. Only the best have any chance of survival.

Plastic laminates will compete as a structural material, due to many characteristics which are very attractive to all engineers, viz., high strength, ease of fabrication, low density, low cost of mass production, and dimensional stability. These attributes put them far ahead of light metals, glass, and plywood. The need for a good economical reinforcing agent for plastics has been apparent for a long time. Realizing that cotton fibers have tensile strengths ranging up to 100,000 pounds per square inch, and making use of that knowledge, we are now able to produce a laminated stock from nonwoven fabrics. These have chemical and physical characteristics never before produced with woven cloth. Some of these properties are high tensile and flexural strengths, high impact resistance, low water absorption, low density, high dielectric strengths and superior machinability. This method of fabricating plastic bonded fibers offers a range of properties obtainable only by those materials made from impregnated webs. For example, the weight strength ratios of these materials lend themselves well for the construction of mobile units, such as airplanes, automobiles and truck bodies, boats, and trailers. Where strength and light weight are of paramount importance, these products should prove indispensable to the industry. The strength of this material compares well with structural steel, whereas its weight is only one-sixth as much. It is also only three-fourths as heavy as magnesium. This plastic is dimensionally stable and weather proof and needs no protective coating.

Unwoven cloth laminates compete favorably with wool and other materials now on the market for home and industrial buildings of special designs. Its beautiful finish and variety of colors for inside decorations and its durability for outside wear are unsurpassed. Its satin smooth finish and colors are finding wide uses in both home and office furniture.

The machinability of this new type plastic material is outstanding. Ordinary tools machine it easily, leaving a smooth surface with no visible fibers. This has made possible refinements in many small machine parts heretofore unobtainable. Surfaces have been produced almost as smooth as glass and, if desired, these may be polished to a mirror-like finish.

Improvements have also been made in the heavier utility fields. The utilization of its extra strength, flame proofness, and light weight to make more durable machine parts, vats, and pipe, and a host of other materials that are too numerous to mention here, prove the importance of this product.

The process used in manufacturing this unwoven cloth differs somewhat among the different mills, but in general makes use of the conventional cotton mill machinery now in operation. The machinery is so set that the fabric is produced in a continuous process and the fibers have most perfect parallel arrangements. The production in pounds per hour depends largely upon the weight per square yard and number of machines in a single line. For example, fabrics ranging in weight from one yard to thirty yards per pound have been produced. Thickness can be varied within wide limits. It is also possible to produce unwoven fabrics with smooth, papery- or flannel-like surfaces, depending upon the end use. Both the raw materials used and the manufacturing operations are subject to considerable controlled variations, making it possible to design fabrics to meet the specifications of many applications.

In conclusion, it may be said that modern engineers who are developing nonwoven textiles are not only blazing trails to better textiles but art recovering some of the markets that have been lost to cotton by the encroachment of competitive materials.

Discussion

Chairman Osha: Mr. Edwards would be very happy to answer any questions.

Mr. Boxser: When some of these nonwoven materials are used in coat linings, what happens when they are pressed?

Mr. Edwards: As I stated in the paper, the end use has to be considered when one is making a non-woven fabric. Some of them, of course, cannot be used as linings where heat is added. Others may be. These fabrics don't fall in the utility field, where they can be intermingled one with the other.

They tell me a lot of good people are being covered with them now; in caskets.

•

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

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48-1

Education: B.S., Rhode Island State College.

Experience: Chemist, print works.

Age 33; married; references; position in New England desired.

• PATENT DIGEST •

Tenter Frame, Preheating with Infrared Lamps G, 3

Brit. P. 587,966
(Charlesworth, May 9, 1947)

The inventor proposes to bring the fabrics to be treated on the tenter frame first to "steaming temperature". Thus the wet fabrics are led in zig-zag form through a case fitted on the top and on the bottom with appropriately spaced series of infrared lamps. The leading rollers are made from copper so that they have a radiating effect on the fabrics. The specification that the "fabrics leave the casing in the most favorable condition" for the tentering process. The infrared lamps are started and switched off together at the same time when the machine is started or stopped.

Brit. P. 589,557
(Haighton Ltd., Davies, June 24, 1947)

A mechanical anti-shrinkage treatment is described in this patent. It is somewhat similar to the patent, abstracted above. It has been observed that the fibers can be fixed by the action of infrared rays which are developed by gas burners, heating refractory material which radiates these rays by projecting them on the material conveyed through a drying chamber. The fabrics are fed to a small tenter frame in a wet swollen state.

References: A detailed and very instructive survey has been offered in August 1943 in a publication of the Textile Research Institute (10 East 40th Street, New York, N. Y.) by S. L. Grapnel. Remarkable data are given on infrared drying by gas burners, etc. This article mentions particularly an article in "Textile World" Jan. 1943, p. 56-58 where "Sanforizing" with lamps, giving off infrared rays, is discussed.

PAUL WENGRAF

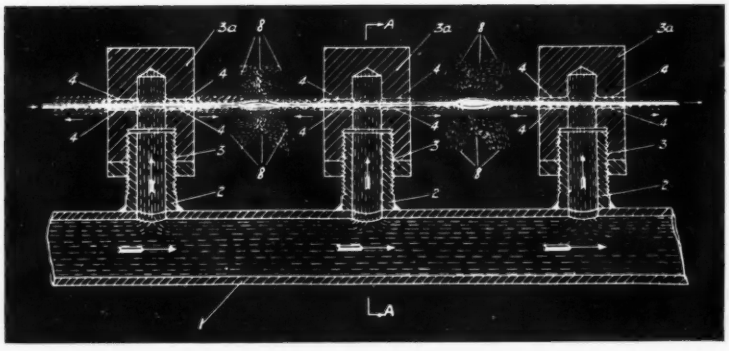
Prewetting Textiles G, 5

Brit. P. 587,599
(Imp. Chem. Ind., Kolbert, April 30, 1947)

The apparatus intended for pre-wetting or otherwise treating textiles with liquids suggests a new method for impregnating fibrous materials. This method can briefly be characterized by a device where the material to be treated advances through tubes, serving for pressing liquid from two different sides against the fabrics. The invention may best be illustrated by the accompanying drawing (the example relates to cylindrical textiles such as tow or skeins but the horizontal members, 4, can as well be constructed as casings for transporting woven fabrics). A main supply tube (1) is connected with branch tubes (2) which bear on both sides protruding tube members (4). The liquid pressed from opposite sides through these tubes meets at points (8) to form turbulent zones. Former wetting systems had the drawback that the pull on a travelling tow of filaments brought the single fibers so closely together that the liquid was almost prevented from penetrating to the center of the tow. In contradistinction to these former methods the filamentary material passes progressively through the successive counter- and co-directional jets, emerging from (4) and through the turbulent zones (8) where the tightened row is permanently loosened up.

Earlier work done in this field: Ger. P. 654,506 (Kullen & Co.) describes a prewetting device consisting of two brush rollers rotating in an inverse sense in water. The water jets projected against one another meet and cause a turbulent movement resulting in a mist which is used for moistening fabrics.

Prewetting Textiles—B. P. 587,599.



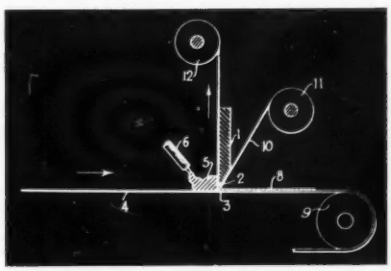
Spreading Device, for Finishing Textiles G, 3

U. S. Pat. 2,426,572
(Andrews-Alderfer Co., Alderfer, Aug. 26, 1947)

The invention has the purpose of improving known methods for spreading dispersions of rubber or rubber-like substances and viscous and plastic materials. The process is said to be particularly useful where very thin layers of accurate gauge are desired. The devices, used up to now, do not prevent small lumps of material or grit being caught by the ordinary spreader blade or doctor blade. Streaks result in the coated material and the blade has often to be removed and to be cleaned. The device protected by this patent tends to eliminate these drawbacks by continuously removing adherent lumps or coarser parts. In the accompanying drawing, (1) the usual blade, ends in a sharp edge (2). The mass to be spread (5) is supplied the fabric (4) by a spout (6). The web of fabrics moves forward carrying the coating material (5) beneath the blade, thereby forming a layer (8) on the web (4). The principal feature of this patent is that a thin sheet (10) coming from roller (11) moves slowly around the blade (1) and is rolled up on (12). This sheet cleans continuously the edge of the blade. Any lumps or coarse particles which pass the line (3) will cling to the sheet (10). It is suggested that the sheets (10) should preferably be made from flexible, thin plastics for instance from co-polymers of vinyl compounds and chlorinated rubber or the like, having a sufficient tensile strength. The speed at which this sheet moves should be about 10-20 feet per minute.

References cited by the Patent Office are, among others: U. S. Pat. 2,360,037,

Spreading Device—U. S. P. 2,426,572.



1944 (Western Electric Co.) protecting a coating device for wires in which the excess of coating substance is removed by a conical blade.

Earlier work done in this field: Ger. Patent 644,904 (Siegenheim) tries to avoid irregularities in coating fabrics by regulating the angle formed by the doctor blade and the fabric's surface. Thus the thickness of the layer can be changed as desired but the impurities are not removed as in the present patent specification. Austrian Patent 143,525 (Latex Proc.) proposes to use an endless screw instead of a blade whereby the latex paste is mixed during the coating procedure and probably also lumps are better distributed within the coating composition.

Ager, for Screen Printed Fabrics D, 5

Brit. P. 588,406
(Jellinek, May 21, 1947)

The invention relates to a new ageing device, particularly intended for handling screen printed fabrics which carry notoriously large quantities of printing paste and are therefore very much subjected to marking-off of the printed areas. Generally a greater production of screen printed fabrics has been hampered by the necessary development in cottage steamers. Some modern devices (probably the Gerber-type ager, see below) are known where the printed areas do not contact the leading rollers but even there the color nevertheless penetrates the fabrics and sticks on the opposite side of the tissue. thus smearing on the rollers surface. The device, protected by the present patent consists of two chambers (A) and (B). The fabrics are suspended by hooks (C') on one of the selvages and carried by an endless chain (C) through both chambers. Chamber (B), called the "Ante-Chamber", is inclined. The path described by the chain can be seen in Fig. 2. It forms first a straight line in Chamber (B) and then a "meander" form in (A). The problem to age or steam printed fabrics as long as desired is solved by varying the distances between the guides. No smearing has to be apprehended because there is no contact at all between the neighbor layers of the printed fabrics. The devolopment of the prints follows logically the principle of loop-treatment and loop-drying devices.

Reference regarding earlier work done in this field: The "Gerber" ager has been patented in Brit. P. 486,029 and 486,070. The problem of avoiding any direct contact of the printed areas with the transporting rollers during the ageing operation is solved here by introducing the printed fabrics into a hollow space situated in the center of the ager and surrounded by the steaming device. The fabric is led from the highest point of the pile of fabrics into the ager and conveyed in spirals through the steam filled apparatus until it reaches the outer wall where it is withdrawn by a slot. Of course the drawback of smearing on the roller's surface by color penetrating through the fabric is not eliminated here in contradistinction to the construction described in the present patent. The characteristic of the "Krostewitz" ager, often described in some publications of former times, is that the printed goods run on one side of the rollers only and that instead of turning in the center of the ager to the other side the fabrics are withdrawn by a diagonal slit.

Ager—B. P. 588,406.

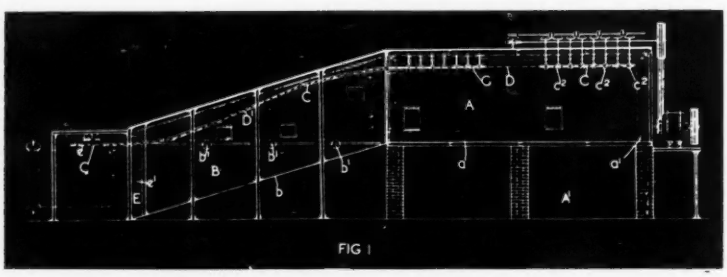


FIG 1

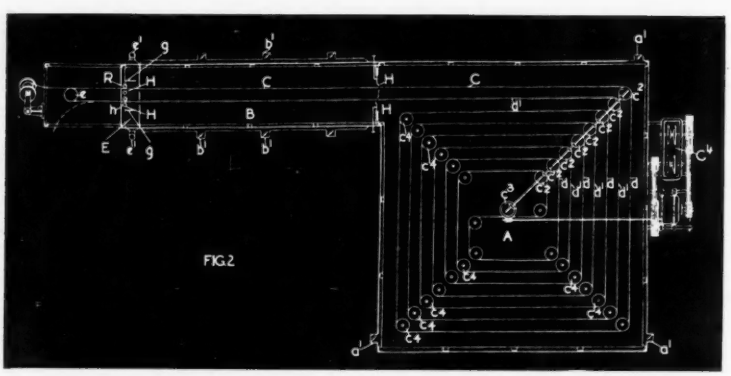


FIG 2

Water Repellent Compositions, Behenic Acid Amide G, 2, 02

U. S. Pat. 2,426,790
(du Pont, Pikl, Sept. 2, 1947)

Reference is made to the abstract in AMERICAN DYESTUFF REPORTER 1947 p. 395 (Brit. P. 581,517-18) where the use of behenic acid has been mentioned. The present invention has the purpose to prepare amides of behenic acid for producing water repellent effects on textiles. Fatty acid amides are frequently reacted with formaldehyde-yielding agents and hydrochloric acid to produce methylene chloride derivatives. The amide is usually suspended in an inert solvent, water-free formaldehyde (trioxymethylene or paraformaldehyde) is added and dry hydrochloric acid is passed through the mixture. Thus it was expected that behenic acid amide $C_{21}H_{43}CO.NH_2$ might be easily transformed into the corresponding N-methylene chloride:

$$C_{21}H_{43}CO\ .N(H)\ CH_2Cl$$

but the amides treated in this way did not give any superior water repellent effect. It is assumed that two behenic acid amide molecules are first linked to one formaldehyde and that these (intermediary) products, being difficultly soluble in the formaldehyde solution do no more react with the second formaldehyde to form water-dispersible substances. A satisfactory solution of this problem was found: any excess of the behenic acid amide had to be avoided in the reacting liquid and it has always an excess of formaldehyde to be present in the mixture. The behenic acid amide has to be gradually added while passing hydrochloric acid through the solution of the reactants. The thus formed chloromethylamide, a polymethylene polyamide, has a wax-like character. It reacts with pyridine or other tertiary bases to form "Zelan"-like products.

References cited by the Patent Office are amongst others:

U. S. Pat. 2,331,276, 1943 (same com-

pany and same inventor): reacting N-methyl chlorides of higher fatty acids, for instance $C_{17}H_{35}CO.NH.CH_2Cl$, with thiocyanate and condensing these products with tertiary bases to obtain water repellent effects.

U. S. Pat. 2,338,177-79, 1944 (Ciba): describes the step of solubilizing higher amides by reacting them with di-halogenalkylethers and linking the reaction products to isocyanates, amides, etc.

U. S. Pat. 2,301,352, 1947 (Heberlein): protects the reaction of ammonia-formaldehyde-concentrates with fatty acid chlorides (for instance hexamethylene tetramine plus stearic acid chloride) to obtain quaternary compounds useful for permanent waterproofing.

U. S. Pat. 2,302,885, 1942 (Gen. Aniline): suggesting to transform fatty acid amides with formaldehyde and hydrochloric acid into halogen-methyl compounds and reacting these compounds with thiourea.

Foreign Bodies in Wool, Determining H, 2 01

U. S. Pat. 2,427,435
(Baird Associates, Inc., Wollner, Sept. 16, 1947)

Burrs, oats and small fragments of vegetable matter are regularly intermixed with wool. To determine the amount of these foreign substances three methods have been used: (1) picking-out the vegetable bodies by hand which procedure is very lengthy and troublesome; (2) dissolving wool in diluted alkalies to determine the insoluble cellulose parts and (3) "carbonizing" a sample with sulfuric acid and removing the dust of destroyed cellulose after drying. (2) and (3) are rather inexact. The inventor proposes to submerge the wool material to be tested in a liquid having substantially the same refractive index as that of the material to be investigated. In transmitting light through the liquid the foreign matter is visible only as shown for example in the accompanying figures 1, 1a, 2, 2a while the main portion of the sample disappears in the surrounding liquid. Pictures obtained in this way in form of microphotographs are compared with those of samples prepared with known amounts of foreign bdies. A liquid, having about the same index of refraction as wool (usually about 1.555) consists, for instance, of 200 p. of kerosene and 175 p. monochloronaphthalene.

References cited by the Patent Office are amongst others:

U. S. Pat. 2, 313,143, 1943 (Radio Corporation of America): an apparatus for examining quartz by inspecting crystals in a paralleloscope.

U. S. Pat. 2,264,380. 1941 (Radio Corporation of America): describing a method for locating the "X-axes" of quartz crystals.

Earlier work, done in this field:

Reumuth described in the German Periodical "Spinner & Weber", 1934 N° 22, 9-12, a way for detecting "unripe" cotton by polarization methods. "Textil-Zeitung" Klepzig, 1937, p. 509-515: Boehme Fettchemie Ges. m.b.H. developed a method for microphotographing textile fibers, by embedding them in a medium, having approximately the same refractive index as the fiber. Reumuth, Schwerdtner and Kling developed this method in the same periodical, 1936, p. 12-18 and 612-617. They described the results of embedding textile fibers in a special liquid, called "R-O-X" and illustrated by microphotographs the differences in structures of mixed and raw fibers containing impurities.

Foreign Bodies in Wool—U. S. P. 2,427,435.

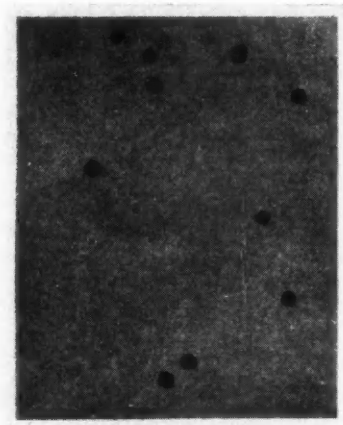


Fig. 1

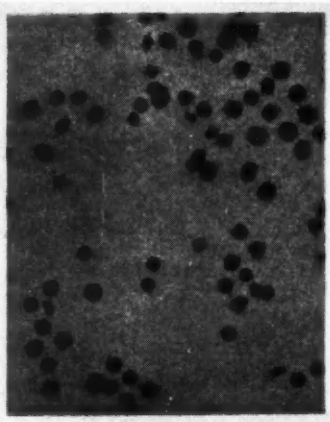


Fig. 1a

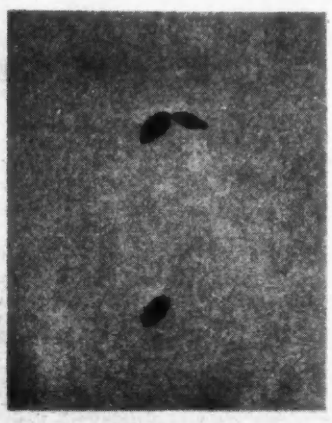


Fig. 2

Fig. 2a

Transparentizing Fabrics, Modified Aminoresins G, 2, 01

Brit. P. 588,469
(Heberlein & Co., May 22, 1947)

A former patent of this company described a process of treating natural or artificial fibers to impart them an organdie or transparent effect. (Brit. P. 581,785 see abstract in AMERICAN DYEST. R. 1947, p. 395). It comprises the application of a coating layer consisting of at least 5% of an organic-solvent-soluble, water-insoluble amino ether resin, preferably an alkylether of a formaldehyde-urea-or of a melamine-formaldehyde resin in emulsion. The concentration of these emulsions was at about 10%. The innovation disclosed in the present patent consists of the application of a urea or melamine resin wholly or partly etherified with an alkyd resin so that the amount of resin, deposited on the fibrous material increases the weight of the fabric less than 50%. An example

gives the following figures: 800 p. of an 80% solution of mixed alkydaminotriazine-alhehyde resin in butanol, 20 p. nitrocellulose and 180 p. amylacetate. This paste is printed, the fabric is predried and cured for 5 minutes at 130° C. As a result a transparent print is obtained which acts as a resist against subsequent applications of direct dyes. The alkyd-aminotriazine-formaldehyde resin, mentioned here above, can be prepared by esterifying glycerine with oleic acid and phthalic anhydride, dissolving it in butanol and adding methylolmelamine by applying heat.

Reference: U. S. Pat. 2,299,200 (Am. Cyanamid) relates to the use of melamine resins in parchmentizing operations. The action of concentrated sulfuric acid can be slowed down by adding melamine. The cellulosic fabric can be immersed in sulfuric acid, containing some melamine, for 30 seconds without endangering the fiber. Obviously no resin formation was intended in this patent.

Direct Dyes—Improving Fastness by Dicyandiamide Condensates G, 4, 01

Brit. P. 588,990
(Geigy, June 9, 1947)

The water fastness of direct dyeings can be improved by several agents which generally belong to the cation-active type. It is also known, as disclosed in the present specification, to aftertreat direct dyeings with condensation products of dicyandiamide with formaldehyde. These condensates have however some disadvantages when applied for improving the water fastness. They are sticky in the liquid state and moreover they are hygroscopic having thereby the tendency of agglomerating in a solid state. The present invention claims to eliminate this drawback by using condensates of dicyandiamide-formaldehyde reaction products with ammonium salts of mineral acids and bringing about further condensation with formaldehyde. According to an example 84 p. dicyandiamide and 100 p. formaldehyde (30%) are refluxed and 54 p. ammonium chloride are mixed with this pre-condensate. The condensate is heated for some hours at the boil and finally 200-300 p. formaldehyde are added to make the condensation complete. A non-hygroscopic but water-soluble powder results which has to be applied from a 0.03% solution to make the direct dyeings fast to water.

References: Brit. P. 576,562, 1946 (of the same company) suggested to improve the fastness to water of direct dyeings by special water-soluble resins, prepared from dicyandiamide, urea, ammoniumchloride, mixing this pre-condensate with formaldehyde and treating it thereupon with glacial acetic acid. These condensates are said to leave the fastness to light unchanged while most of the aftertreating agents for direct dyeings impair this fastness to the same degree as the fastness to water is increased. Biguanide complex compounds, prepared from dimethylamine, dicyandiamide and copper salts, are used for aftertreating direct dyeings according to Ger. P. 657,117 (I. G. Farbenind.)

Printing Vat Dyestuffs and Other Insoluble Dyestuffs, with Varnish-like Thickeners D, 2, 07

Brit. P. 589,020
(Bener, June 10, 1947)

Color pigments are applied by a water-insoluble carrier in printing paper, wallpaper and the like. That means great and cheap production and therefore many attempts have been made to adapt these methods, used in paper printing, for textile printing operations. The well-known "Aridye" process uses relatively large amounts of water-insoluble solvents in emulsion. Now the problem has been approached in another way. Quite generally prints of the type used in paper decorating and transferred to textile printing processes have the drawback of poor fastness to crocking and of a dull appearance, due to the nature of the varnish thickener which covers the pigment. The present invention tries to solve the problem by applying printing compositions which contain the dyestuff pigments, for instance non-vatted dyestuffs, incorporated with water repellent dyestuff carriers and to treat thereupon the print with means, affecting a physical or chemical modification of the water insoluble carrier: as a result the organic dyestuff solution is no more prevented from penetrating the fiber. Or in other words the water insoluble dyestuff carrier is rendered pervious to any developing agent used for fixing the specific dyestuff group contained in the paste. An instructive example teaches to mix varnish, glycerine, benzyl alcohol and a vat dye (Indanthrene Brilliant Blue), to print this composition according to one of the customary paper printing methods and to aftertreat the printed fabric with a Hydrosulfite NF-potassium carbonate solution. The dried fabrics are aged and re-oxidized thereupon as usual. An unexpectedly great amount of dyestuff was observed to penetrate to the back side of the material.

Earlier work, done in the field of varnish-like printing: the Aridye printing methods mentioned here above have not the purpose to obtain deeply penetrating printing effects, as in the present invention. The difference consists that in the Aridye process the unchanged hydrophobic thickener remains upon the fiber while the water-in-oil emulsion breaks. In Bener's process the varnish-like thickener is only used as an intermediate carrier making possible the application of a pigment according to the paper printing technique, while in a subsequent step, this carrier is transformed in a water-soluble and removable composition. Another earlier suggestion for printing textiles with water-insoluble pastes can be found in Ger. P. 622,227 (Hugentobler et al.): the paste consists of a water soluble dyestuff, varnish as a thickener and a large excess of glycerol or glycol.

Rotproofing Textiles, Metal Oxides G, 1

Brit. P. 588,294
(French & Sons, Eclipse Dye Co., May 20, 1947)

Brit. P. 590,599
(Scapa Dryer, Ltd., Race, July 23, 1947)

An improved process for rendering textile yarns and fabrics resistant to rot, i.e. to the degradation by micro-organisms such as fungi or bacteria is described. The inventors of the first mentioned patent are aware that several processes have been published comprising rotproofing with different metal compounds, particularly metal organic compounds. The copper salts for instance are said to have the defect of producing an extremely dusty material, poorly fixed on the fibers and therefore not stable in storage. The present method consists of precipitating in a two-bath process mixed oxides of chromium, copper and iron by applying first their water-soluble salts and sodium carbonate in a second bath. Certain limits are given for the content on CuO (not less than 0.15% from the fiber's weight) and Fe_2O_3 (not more than 1.2%). Example: first bath: 16% chrome alum, 3% ferric ammonium sulfate, 2.5% copper sulfate crystals; second bath: 1% anhydrous sodium carbonate. A similar method has been patented in the second patent (Brit. P. 590,599): the metals are applied here from complex ammoniacal solutions of copper chromate, the copper chromate being hydrolized by a rinsing treatment. The Cr is substantially removed from the fibers, the copper salts remain therein in a finely dispersed state.

Reference: Earlier work done in this field: U. S. Pat. 2,026,190 (Rhodes) protects a lead chromate impregnation, carried out in two separate steps for preventing the development of mold. U. S. Pat. 2,013,981 (Imp. Chem. Imd.) recommends precipitating barium borate within the fibers, U. S. Pat. 2,035,527 (Alum. Comp.); an impregnation with water soluble chromium salts and precipitation with alkalies.

ABSTRACTS

The Measurement of the Affinity of Monobasic Acid Dyes for Wool

D. R. Lemin and T. Vickerstaff, page 31. "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This paper is summarized as follows:

The affinity of a dye for a fiber may be considered as a numerical value representing the difference in the standard chemical potential of a dye in solution and the potential of the dye in the fiber.

The following conditions: (a) the adsorption of free dye acids, (b) the displacement of dye anions by inorganic anions and (c) the competition between dyes for fiber dye sites yield equilibrium measurements which, when used in conjunction with equations, allow the evaluation of affinity. The development of the equations for use with the three methods are given.

Using six dyes and wool fiber the equations for the three methods were verified for a range of salt and dye concentrations at varied values of pH.

The experimental procedure and test data are included.

Industrial Dye Vat Control

F. Blezzard, page 58, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

The advancement of the control industry along with increased knowledge of dyeing has resulted in the development of dye vat regulators offering satisfactory performance. Control in the dye vat is based mainly on time-temperature characteristics.

The field of dye vat control and the conditions to be regulated are reviewed.

The failure of the early self-operated type regulator is analyzed and examples given of modern dye vat controls.

The performance characteristics of the newer type instruments are given along with several figures showing regulator layout and operation.

The Combination of Acid Dyes with Amine and Amide Groups in Nylon Fiber

P. W. Carlene, A. S. Fern and T. Vickerstaff, page 15, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

It has been shown that in the dyeing of nylon with acid dyes the primary combination takes place on the amino-groups. However, at low pH values additional dye attachment takes place and it is suggested that this occurs on the amide groups. This effect is shown by means of a titration curve of nylon with Solway Blue B.

The amide groups are of most importance in practical dyeing since they provide the dye sites at the usual dyeing pH values of 3.0 to 6.0. Although nylon yarn is badly tendered when dyeing at pH 1.0, compatibility for mixed dyes is obtained through the dye sites offered by the amide groups.

An investigation was undertaken to determine the effect of various types of dyes on the mechanical properties of nylon. The experimental work is described in detail.

The experimental data shows that the physical characteristics of nylon monofil undergo considerable change when dyed with acid dye to the point where the amino-groups are saturated and adsorbtion on amide groups begins. The physical change is evidenced by a drop in breaking strength and elongation. Comparative samples dyed with Solacet and dispersed cellulose acetate rayon dyes using a neutral bath did not evidence physical change. However, when Solacet dyes are applied from an acid bath, fiber degradation occurs.

Several tables of experimental data are included.

The Diffusion of Direct Dyes into Cellulose
1—A Surface Potential Theory of the Effect of Salt and Temperature on the Apparent Diffusion Coefficient.

J. Crank, page 37, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This paper presents a quantitative explanation of the dependence of the apparent diffusion coefficient on salt concentration and temperature.

A diffusion equation is developed in which dyeing is considered as activated diffusion with absorption, the energy of activation being that which is required by a dye ion to pass an electrical potential created by the combined charge of the cellulose and the surface adsorbed dye ions.

Experimental data are given which support calculated data showing the apparent diffusion coefficient to be dependent upon sodium chloride concentration at a given temperature. Calculated coefficients for varying temperatures at a given salt concentration are comparative to the experimental data for temperatures of about 60° C. Theoretical values below this temperature are too high, this being considered due to dye ion aggregation at the lower temperatures.

The physical assumptions on which the mathematical theory of this paper is based are reviewed.

Dyeing: A Comparison between the Changes in German and American Practice

R. G. Fargher, page 47, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

The use of synthetic fibers in conjunction with cheap labor and high export subsidies has, in general, limited German dyeing developments to that of refinement of existing methods. However, high labor costs in America together with the availability of cotton has led to changes in machinery which allow high production and low labor costs.

A cmparative review of yarn and piece dyeing is given as well as comments on continuous dyeing.

Modern American Dyeing Practice

H. F. Clapham, page 83, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This paper reviews current dyeing methods in use in America for the processing of cotton, wool and the synthetic fibers.

The pad-steam continuous dyeing process and the Williams unit are discussed. The older vat dyeing procedures are briefly given in order to emphasize the need for the newer continuous methods.

A description of the continuous dyeing of indigo navy blue on all-wool flannel is included as a war-time development.

The Application of Dyeing Theory to Dyeing Practice

E. B. Abbott, H. Crook and F. Townend, page 77, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This paper summarizes a few of the recent developments in dyeing theory and

relates the theoretical to the practical dyeing procedure.

Dyeing theory for nylon, wool and cellulose is discussed. Peters' theory regarding the nylon-acid dye combination is reviewed with regard to the practical behavior of acid dyes on nylon.

Wool dyeing with acid dyes parallels that of nylon with one important difference being the amino-group contents. This subject is discussed as well as the dyeing properties of weathered wool and wool treated with acid or alkaline hypochlorite.

Although much research into the dyeing of cellulose has been attempted, little has been accomplished with regard to the nature and mechanism of the dye-fiber union.

Some Factors Affecting the Dyeing of Viscose Rayon

Part I—Preliminary Survey

J. M. Preston and P. Pal, page 50, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This paper describes a preliminary investigation made to determine the effect of various factors on the physical state of viscose rayon fibers and their relation to dyeing.

Nine factors were examined and of these it was found that, within wide limitations, the size of the spinneret holes, the temperature of the spinning bath and the time and temperature of drying could be ignored.

Experimental results show that the rate of dyeing on an equal area basis is independent of the filament denier. Data obtained on fibers subjected to varying periods of immersion in the coagulating bath indicate that a slower rate of dyeing may be expected as a result of longer periods of immersion. Latent strain above 2% as well as viscose ripeness and spinning tension are other factors found to have considerable effect upon the dyeing of viscose rayon.

Some Factors Affecting the Dyeing of Viscose Rayon

Part II—The Effect of Orientation

J. M. Preston and A. H. Kapadia, page 55, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This investigation is concerned with the effect of extreme orientation on the dyeing of viscose rayon. The experimental work is described in detail and results are given which indicate that with increasing orientation the rate of dyeing decreases.

A discussion is included which presents a theoretical explanation for experimental results obtained.

Tendering of Vat Dyed Textile Materials on Exposure to Light

H. A. Turner, page 3, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

This paper reviews developments in the field of light tendering of vat dyed textile materials.

Essential factors which are discussed in relation to tendering are: light, the substrate, the actine dye, moisture and oxygen. The electro-chemical behavior of vat dyes is considered as well as molecular changes of the dye molecule as caused by light.

The absence of complete data with regard to vat dyes on fiber is emphasized and approaches for experimental investigations are suggested.

The Heats of Reaction and Affinities of Direct Cotton Dyes for Cuprammonium Rayon, Viscose Rayon and Cotton

W. J. Marshall and R. H. Peters, page 64, "Recent Advances in the Theory and Practice of Dyeing", Symposium of the Society of Dyers and Colourists.

The affinity of fourteen direct cotton dyes were calculated using adsorption isotherms determined for cuprammonium rayon, viscose rayon, cotton and mercerized cotton at temperatures ranging from 50° C. to 100° C. From these results heats of reaction were calculated.

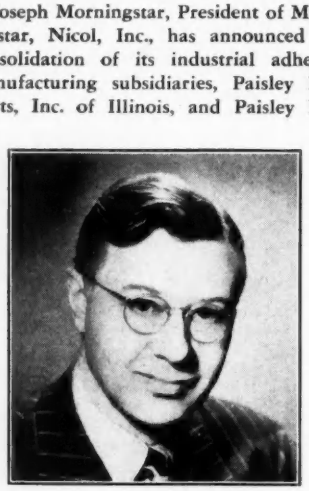
The heats of reaction and affinities thus obtained lead to the conclusion that the mode of attachment of direct dyes to different cellulosic fibers is the same and differences in dyeing behavior are therefore due to variations in physical structure.

The theory followed in this investigation is given as well as a complete description of the experimental work. Complete tables of experimental data are included.

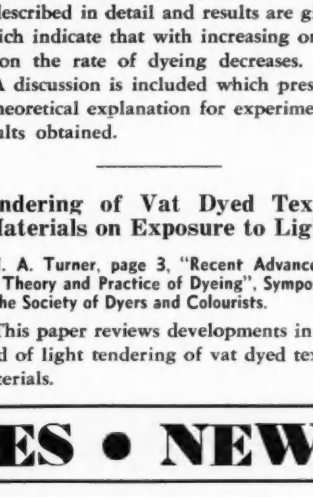
TRADE NOTES • NEW PRODUCTS

• Paisley Plants Consolidate

Joseph Morningstar, President of Morningstar, Nicol, Inc., has announced the consolidation of its industrial adhesive manufacturing subsidiaries, Paisley Products, Inc. of Illinois, and Paisley Products, Inc. of New York. The change became effective January 1, 1948. Murray Stempel, formerly General Manager of the Chicago Company has been elected Vice-President and General Manager of the consolidated operations. Earl C. Lenz, formerly Sales and Service Manager of the Chicago plant, has been promoted to General Sales Manager. He will also continue to direct the advertising and sales promotional activities of the consolidated operations. L. J. LaBrie, formerly Technical Director, has assumed the position of Sales Manager of the New York plant.



Earl C. Lenz



L. J. LaBrie

Mr. Morningstar also announced that the Hawthorne, N. J. dextrine plant of Morningstar, Nicol, Inc., is undergoing extensive construction to increase production over 30%. Ed. Hillary, formerly Sales and Service Manager of the Eastern Division, has been appointed Production Manager, and is in charge of construction of this major improvement program.

• Now Producing Starch

American Key Products, Inc., 15 Park Row, New York City, announces that the recently completed Potato Starch plant,

owned by the Idaho Potato Growers, Inc., Idaho Falls, Idaho, has made a successful initial run, producing several cars of high-grade Starch. American Key Products has been appointed distributor. The plant has a productive capacity of about 20 tons per day, but due to lack of raw materials no regular operation will be possible during the remainder of the current season. The same producer also operates a large dehydration unit at Idaho Falls.

• Water Soluble Oils

A recent development that has been translated to commercial production now makes available in commercial quantities a number of chemical esters, of an oily character, that are said to dissolve clearly in water.

Chemically these products are polyoxyethylene oleates and laurates having a molecular weight above 800. They are non-ionic, non-toxic, light in color and fluid or grease-like in consistency. They are said to dissolve clearly in water, alcohol, esters, hydrocarbons and vegetable oils. At 20°C they are slightly heavier than water. They all have high boiling points and exhibit surface-active properties.

The above properties indicate their use as special detergents in textile and fiber processing; as penetrating lubricants; grinding media for pigments; plasticizers for water dispersed products and water-insoluble resins, elastomers, plastics, coatings, etc.; emulsifying agents for oils and hydrocarbons.

They are produced and sold under the names of Polyethylene Glycol Mono Oleates (S1005) and (S1010) and Polyethylene Glycol Mono Laurate (S1019) by the Glyco Products Co. Inc., Brooklyn, N. Y., from whom samples and a specification sheet are available.

• Aralac Casein Fiber Plant Sold by National Dairy

L. A. Van Bomel, president of National Dairy Products Corporation, has announced the signing of a contract for the sale of the company's Aralac plant at Taftville, Conn., to the Virginia-Carolina Chemical Corporation of Richmond, Va., of which A. Lynn Levy is president, and that National Dairy plans to discontinue operations in the casein fiber field.

Aralac, a protein textile fiber made from milk casein, has been used principally in the manufacture of felt hats and upholstery and as a blend in the production of clothing textiles.

"We are discontinuing the manufacture and sale of Aralac, even though the project resulted in a substantial profit to the Company", Mr. Van Bomel stated. "Development of other more profitable uses for skim milk products has resulted in a marked increase in the cost of casein from which Aralac is made."

The Virginia-Carolina Chemical Corporation, it was explained, has found the Taftville plant suited to its plan to produce fibers from vegetable protein, which is in adequate supply from domestic agricultural sources rather than from casein.

The sale involves 39 acres of land at Taftville in the town of Norwich, Conn., a one-story and basement factory building and other auxiliary structures, machinery and equipment. It does not include the present plant inventory of Aralac, which will be baled to fulfill existing contracts for the fiber.

• Vice President of Hooker

Bjarne Klaussen, who has been promoted to vice president in charge of production of the Hooker Electrochemical Company, Niagara Falls, New York. Mr. Klaussen, a graduate of the University of Oslo, has been a member of the Hooker organization since 1916. He has been Works Manager of the Niagara plant since 1940 and a member of the company's board of directors since 1942.

"If there are any important messages while I'm out, Miss Suggs, just jot them down on odd scraps of paper and lose them, as usual"

GARDNER REA.

• General Releases

General Dyestuff Corp., 435 Hudson Street, New York 14, N. Y., announces release of circulars describing the following products:

Rapidogen Brown IR* (Patented)—a stable azoic compound soluble in alkali, which, after printing and drying, can be developed in acid ageing to form an insoluble pigment said to possess superior fastness properties. It produces on cotton and rayon a desirable rust shade said to possess excellent fastness to light and good all round fastness properties. It dissolves readily in caustic soda and has good stability in the print paste. The prints can be developed by the conventional acid ageing, or if caustic soda is replaced by Developer Base RPN in dissolving, they can also be developed by neutral ageing. The product can, therefore, be printed alongside vat colors. The neutral developing method is said to have the additional advantage of producing smoother prints on rayon fabrics than the conventional caustic soda method. Circular G-504.

Nylon Resist GDC—a new textile auxiliary with which white or colored resists can be produced on nylon. The product may be applied to colored or uncolored nylon yarn intended for decorations in woolen or worsted fabrics, and is also applicable to fabrics containing nylon and wool where a two-tone effect is desired. It is said to possess satisfactory fastness to the fulling and scouring treatments customarily given to worsted fabrics. It is a fine, nearly white powder which dissolves in boiling water. If it is to be used at low temperature it can be dissolved by pasting first with an equal amount of cellosolve. It does not cause staining of the material. Circular G-511.

Colloresine HV, MV, LV*—new thickeners for textile printing. The Colloresine V Brands are a new series of water soluble cellulose derivatives, differing from one another in the degrees of viscosity produced in aqueous solutions. They are said to offer several distinct advantages: readily soluble in hot or cold water; do not coagulate upon heating; stable in

the presence of alkalies and hard water. They are said to produce prints with sharp outlines and a soft hand. The gum washes out easily with cold or warm water, eliminating the necessity of rope soaping. The circular gives considerable specific information regarding the uses of the various brands. Circular GDC-280.

* Reg. U. S. Pat. Off.

• Joins Hainsworth Supply

Joseph E. Goodavage, formerly of Sharples Chemicals Incorporated, Philadelphia, has joined the firm of Hainsworth Supply Company, Philadelphia, Pennsylvania, as Vice President in Charge of Sales.

The Hainsworth Supply Company was established in 1907 and since that time has established itself as a leading supplier of institutional and building maintenance products. In addition to supervising sales, Mr. Goodavage will inaugurate the development of additional sanitary and textile chemical products.

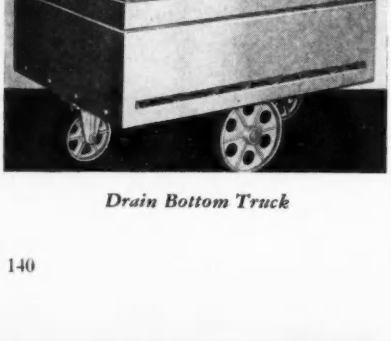
Mr. Goodavage is a graduate of Saint Mary's College and of the Philadelphia Textile Institute where he was in charge of the Dyeing Department for many years. During the war he was a Captain in the Quartermaster Corps assigned to the Research and Development Section of the Philadelphia Quartermaster Depot. In recent years, while in charge of the Textile Chemical Department of Sharples Chemicals, he played an active part in the sales development of important intermediates for the manufacture of anionic type surface active agents.

• Drain Bottom Truck

Lewis-Shepard Products, Inc., with factories in Watertown, Mass. and Crawfordsville, Indiana, announce a new drain bottom truck.

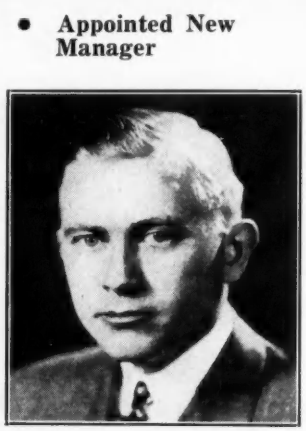
Engineered by Lewis-Shepard as an additional item to their extensive line of special purpose floor trucks, the new drain bottom truck is intended primarily for use in textile mills and bleacheries, permitting the transportation of cloth while it is still draining fluid. It is stated that the truck can be used to advantage in all wet finished textile processes. It is easy to clean the box section of excess dyeing or other fluids by the simple act of flushing it out with a hose. It is claimed that there is no danger of absorption of liquid into the deck or sides of the truck as with wooden trucks, because it is built of 18-8 Nickel Stainless Steel, with rolled edges and reinforced sides and ends for greater protection and safety.

The corrugated bottom drains from the sides of the truck to avoid flowing liquids over the running gear, as is the case with trucks having holes drilled all over the floor deck.



Drain Bottom Truck

• Appointed New Manager



Donald L. Griswold, formerly Metropolitan District Sales Representative of the Calco Chemical Division of the American Cyanamid Company, Bound Brook, N. J., who will take over the management of the Calco Chemical Division, North American Cyanamid Limited, according to an announcement issued by the main office of the company in Montreal.

Mr. Griswold, a native of Madison, Wisconsin, obtained his B.S. degree in chemistry from the University of Wisconsin in 1937. He joined the Calco Chemical Division of the American Cyanamid Company as a student trainee after graduation. With his early training in sales administration and later as New York State and Metropolitan Sales representative of the Calco Division of American Cyanamid Company, Mr. Griswold will bring to his new post a background of experience in the production and marketing of dyes, chemicals and intermediates.

• Translation Service Offered

Research Information Service, 509 Fifth Avenue, New York 17, N. Y. announce that they have compiled and collected practically all of the German documents pertaining to the composition, manufacture, and application of German dyestuffs. Many of these documents have already been translated and, the company states, an order for translated documents can be filled in most cases within one week.

• Dr. Adamson Retires

Dr. William A. Adamson, a pioneer in dye research, retired February 1 after 30 years with the Du Pont Company. He joined Du Pont in August, 1917. His research activities with the company have been for the most part in the fields of basic, alizarine, and anthraquinone vat dyes, and he is accredited with contributing much to the early developments in these fields.

When the Newport Chemical Company became part of the Du Pont Company, Dr. Adamson, together with several other research chemists, was transferred to Carrollville, Wis., where the work on anthraquinone colors was concentrated from 1932 to 1938. In 1938, when the Carrollville personnel was transferred to the Wilmington area, Dr. Adamson returned to Jackson Laboratory at which time he became a member of Jackson Laboratory Patent Division.

• Solvay Changes Announced

Solvay Sales Division, Allied Chemical & Dye Corporation, New York, has announced the following changes in its branch office organization:

Woodward Allen has been appointed manager of the branch office at Charlotte, N. C., covering the Southeastern territory. Mr. Allen, who succeeds the late Harral O. Pierce, has been with the Solvay organization for 28 years, serving as manager of the Boston office since 1930.

M. S. Johnson succeeds Mr. Allen as manager of the Boston office, which serves New England. Mr. Johnson, who has been assistant of that branch, joined the organization in 1926, and recently came to Boston from St. Louis, Mo., where he had been branch manager since 1937.

H. G. Phillips, Jr., formerly a salesman in the Cincinnati territory has been appointed to succeed the late Brice S. Hull as manager of the Pittsburgh branch office. Mr. Phillips has been a member of the Solvay organization for 21 years, having

served most of that time in the Ohio area.

H. W. Causey, has been named assistant manager of the Charlotte office, and M. F. Kennedy has been appointed assistant manager at Pittsburgh. Both Mr. Causey and Mr. Kennedy have served as salesmen in their respective territories for several years.

All of the above changes were effective February 1, 1948.

Effective January 1, 1948, H. R. Stoothoff was named assistant manager of the Chicago branch, and W. H. Floyd became assistant manager at Cincinnati. Mr. Stoothoff and Mr. Floyd have been sales representatives in the Chicago and Cincinnati territories.

• NETF Campaign

The New England Textile Foundation, 68 South Main Street, Providence, R. I. recently passed the $170,000.00 mark in its Second Annual Campaign to raise $250,000.00 for the benefit of the four textile schools in New England. This announcement was recently made by Abbot Stevens, Campaign Chairman and Treasurer of M. T. Stevens & Sons Division of J. P. Stevens & Co. The campaign will continue through June of this year. The actual score at the time of the announcement was 190 gifts for a total of $171,970.00, making an average gift of $905.00. Largest single gift received to date is $20,000.00.

Principal as well as income is being used to strengthen the faculties of the textile schools, to help modernize equipment and to attract the best possible students by awarding scholarships on a competitive basis. Approximately $150,000.00 has already been spent for these purposes with tangible results. Two of last year's freshman scholarship holders, it is reported, won highest honors in chemistry, ten were on the Dean's List, and practically all of them received better than average marks. There are 38 scholarship students at the present time.

• Monsanto Appointment

The appointment of Milton J. Scott, of Springfield, Mass., as assistant director of research of Monsanto Chemical Company's Merrimac Division was announced recently by Josiah B. Rutter, Monsanto vice president and Merrimac general manager.

A research chemist or group leader at Monsanto's Plastics Division in Springfield since 1942, Mr. Scott will direct and supervise textile research and application at Merrimac headquarters in Everett. In addition, he will have charge of coordinating research with textile sales development as well as with other production groups.

Mr. Scott specialized in textile resins, surface coating, moldings and laminations at the Plastics Division headquarters in Springfield. The results of his work are covered by several U. S. patents.

"I didn't know you were in the hospital last year Sheppard—what month was it?"

JEFF KEATE

• Textile Institute Conference

For this year's conference The Textile Institute learns that visitors will attend from France, India and Czechoslovakia. The subject this year is to be "Organization of the Textile Industry and Textile Production". The conference is to be held at Buxton, Derbyshire, in Britain's Peak District, from June 2nd to June 5th inclusive. It immediately precedes another international conference on standardization.

The Institute anticipates that among those addressing the conference will be a prominent member of the British Government. Official receptions by the local civic authorities, presentation of awards, and other social functions, are a feature of the Institute's conference.

Full details are available from the General Secretary, The Textile Institute, 16, St. Mary's Parsonage, Manchester 3, England.

• New Officers, Heyden Chemical

The election of two new vice presidents and three new board members of the Heyden Chemical Corporation was announced recently by B. R. Armour, president.

Simon Askin and Dr. Ralph N. Lulek were named Vice Presidents and were also elected to the Board. Clarence Capes, Vice President of the Bank of Manhattan Company, was the third director named.

Mr. Askin has been associated with Heyden since 1943 and has been an officer of the company since 1945. Dr. Lulek has been research manager of Heyden since 1946 and has also had charge of the ammonia division and the antibiotic division of the corporation.

With the addition of these new members, the Heyden board is now composed of ten directors, including Mr. Armour, Dr. Robert W. Harris, V. A. Johnston, Dr. Donald B. Keyes, John P. Remensnyder, George B. Schwab and Paul van der Stricht.

• Optical Bleaching Agents

The development and the use of optical bleaching agents by the Germans are described in a report now on sale by the Office of Technical Services, Department of Commerce. Methods of manufacture and testing of the chemicals developed, known as "Blankophor B", "-R", "-WT", and "-RG", are discussed.

Optical bleaching agents are fluorescent materials which increase whiteness of textiles and other articles by converting some of the ultra-violet of sunlight into visible light. The agents used must be colorless or almost so as seen by reflection of ordinary visible light and the additional light supplied by fluorescence must be blue in order to enhance whiteness and neutralize the brownish discoloration common in fabrics and many other materials.

The methods of manufacture of the Blankophors are described in the report, and their use as textile finishing agents and laundering bleaches is discussed.

The Blankophors leave much to be desired as optical bleaching agents, according to the report, but they were favorably received and appear to have been the first of such materials applied with real success to textiles. Their fastness to washing was fairly satisfactory but they did not show satisfactory stability when exposed directly to sunlight.

Their chief defect was failure to fluoresce in ordinary artificial light, according to the investigators. However, the Blankophors were considered successful and their manufacture was discontinued only because of war conditions.

The "Lumogens", another group of fluorescent materials manufactured by I. G. Farben, are discussed briefly. The Lumogens are water-insoluble organic pigments intended to have essentially the same color in daylight and in ultraviolet light. They are used for printing maps and for night marking of roads as well as other uses.

A bibliography is appended to the report.

Mimeographed copies of the 23-page report, PB-81099 *(The Blankophors, optical bleaching agents of I.G.)* sell for 75 cents.

Supplementary material consisting of reports and correspondence from I. G. Farben files is contained in German in PB81099-S *(The Blankophors, — Reports and correspondence from the I. G. files,* April 1944; microfilm, $4; photostat $11; 165 pages).

Orders for copies of reports should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

• Joins Rock Hill

Durward Costner joined Rock Hill Printing & Finishing Co., Rock Hill, S. C., the first of the year as Research Director. Mr. Costner was formerly with Riegel Textile Corporation, Ware Shoals Division, Ware Shoals, S. C., and for the past 15 years has been with Piedmont Print Works and Southern Bleachery.

• Alumni Meeting, NBTI

The first meeting of the year for the New York Alumni of the New Bedford Textile Institute was held January 20 at the Builder's Club, 2 Park Avenue.

The annual election of officers was held with the following results:

President: M. Macia, A. M. Tenney Associates.

Vice President: Albert Scaccia, Arkansas Company, Inc.

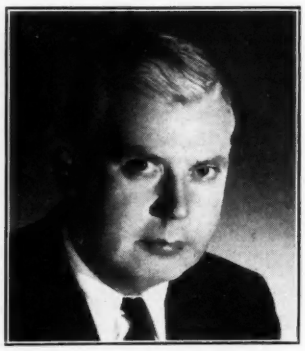
Secretary: C. A. Baker, United States Testing Company, Inc.

Treasurer: Andrew Goodwin, Princeton Knitting Mills.

Board of Governors—3 years: George Hotte, A. M. Tenney Associates.

Committees for the year were appointed by the President and a discussion of the plans for the year was held.

• Joins Cuprinol



Frank E. Firth, formerly technologist with the U. S. Fish and Wild Life Service, Department of Interior, and until recently associated with the Linen Thread Company as manager of their Netting Research Department, who has joined the Cuprinol Division of Dartworth Incorporated to develop the use of Cuprinol products in the fishing industry.

The Cuprinol Division of Darworth expects to utilize fully the wide experience of Mr. Firth on the technological problems confronting the fishing industry, particularly those relating to the preservation of gear.

Mr. Firth is a member of the Harvard Club of Boston and a member of other professional societies. He is also a member of the American Association of Textile Chemists and Colorists, and a fellow of the American Institute of Chemists. His business headquarters will be at the main office of the company in Simsbury, Connecticut.

• New Executive Secretary

At a recent meeting of the American Council of Commercial Laboratories held at the National Bureau of Standards in Washington, D. C., Dr. Harold M. Dudley was appointed Publicity Relations Counsel and Executive Secretary of the A.C.C.L. and A. J. Nydick was appointed Legal Counsel.

• North American Section, Textile Institute

The Textile Institute, international organization of textile technologists, has under active consideration the formation of a Section or Sections of the Institute to serve members and prospective members in North America.

The Council of the Institute has appointed as its official representative to join in discussions on this subject, one of its members, John Boulton, M.Sc., F.R.I.C., F.T.I., research chemist in the Courtaulds organization. Mr. Boulton sailed for America on January 28th to meet leading technologists who are interested in extending the scope and status of the profession.

His visit followed the recent visit of William Penn, F.T.I., another member of Courtaulds' staff and a member of the Institute's Development Committee, with whom discussions on the subject have already taken place.

The Institute's Council has also expressed its readiness to support the formation of Sections in Australia and South Africa.

OBITUARY

J. F. ROTEN

JULIUS F. ROTEN, vice-president and director of L. Sonneborn Sons, Inc., New York, oil refiners and manufacturing chemists, died January 24 at Mount Sinai Hospital in New York City.

Mr. Roten, who was 59 years of age, joined the Sonneborn company in 1905. An authority on petroleum derivatives, he was instrumental in the development of improved methods of refining white mineral oils, petroleums and petroleum sulfonates and in creating new uses for these products in the manufacture of a great variety of end-products including cosmetics, pharmaceuticals, paper, rubber and plastics, and in many types of chemical processing. He was also active in promoting the development and distribution of motor oils and lubricants, textile processing specialties, and products used for building construction and maintenance.

Mr. Roten was also a partner in Sonneborn Brothers, Dallas, Texas, and a vice-president of W. H. Daugherty & Son, Petrolia, Pa. He was a founder of the Oil Trade Association of New York, and a member of the American Petroleum Institute and the Quaker Ridge Country Club.

Mr. Roten is survived by his wife, a daughter, a son, four sisters and four brothers.

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SHADE: The excellent full green shade cannot be equalled in fastness properties by mixtures of other greens and yellows.

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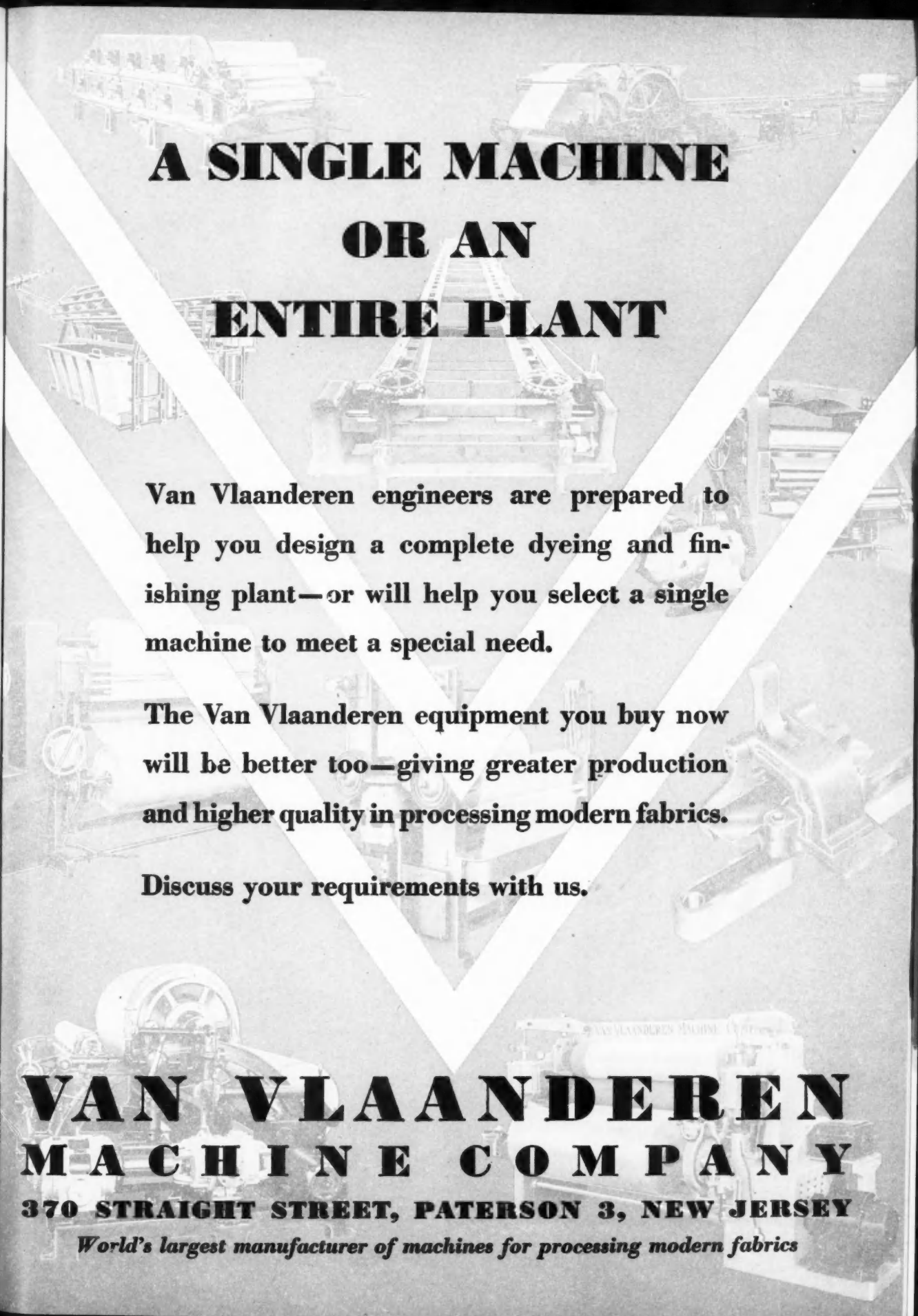

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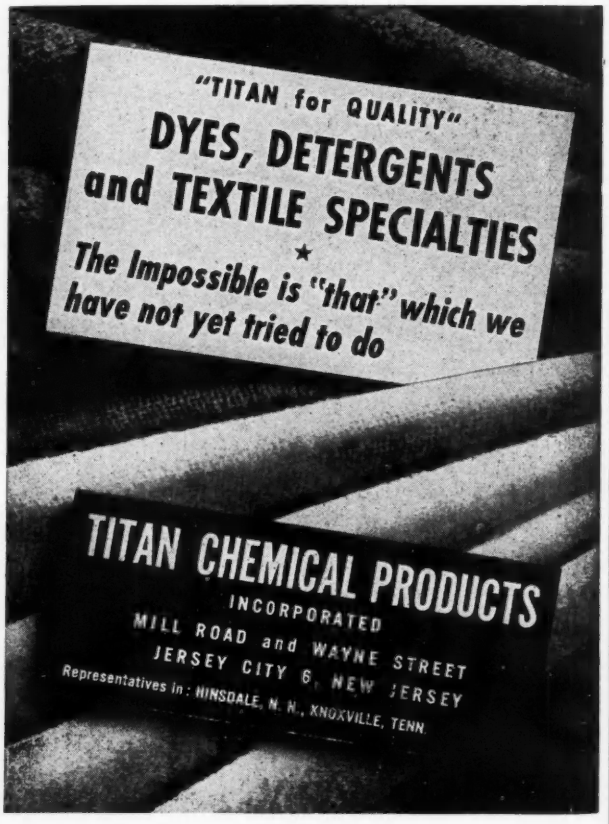
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100% ACTIVE

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HYMOLON K is stable in hard water, acids and alkalis and is compatible with soap. It prevents scum formation and promotes more level dyeing. Hymolon K is a *liquid* detergent and as such is preferred for ease of handling and use.

ECONOMICAL

HYMOLON K is 100% active, contains no water, salts or cheap alkalies, and shows about 4 times the scouring of a good soap. Accordingly, there is less material to ship and handle. Hymolon K economically combines in one product good wetting-out and excellent detergency. The concentration required varies with the type of operation, usually 0.1 to 0.4% on the weight of the goods.

VERSATILE

HYMOLON K is recommended for scouring and dyeing operations for all types of textile fibers; for unsurpassed detergency of all forms of woolens; and for the kier boiling of cotton. It gives a heavy, continuous, foamy bath and is especially useful in cleaning operations where emulsification and dispersion of spinning waxes or oils are of importance.

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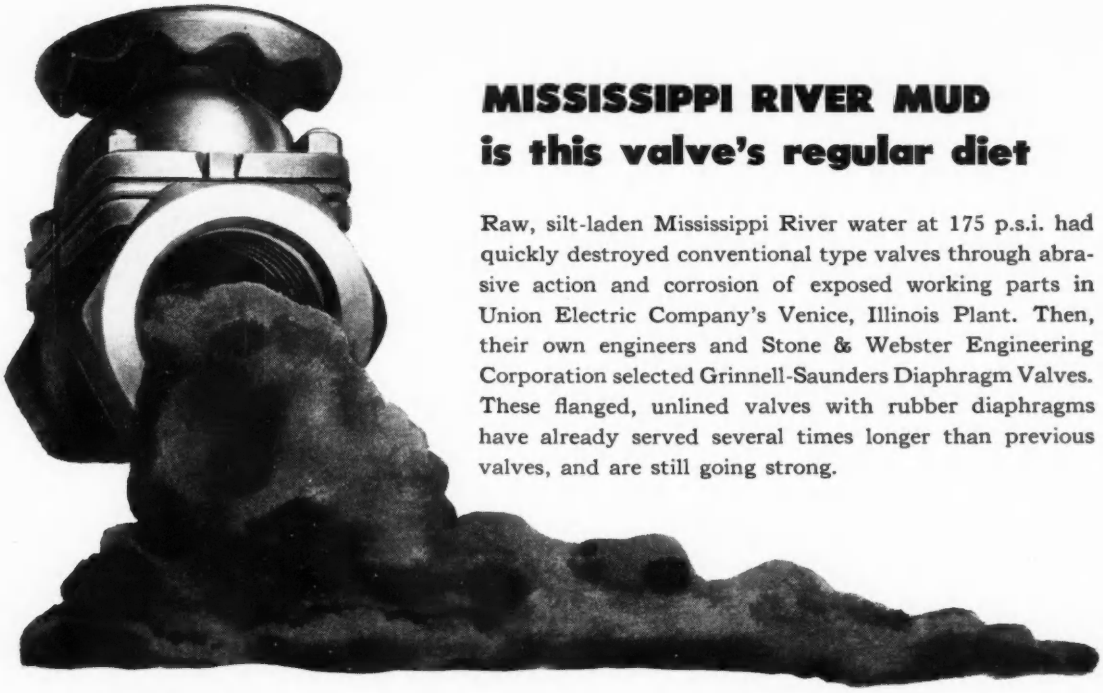

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ISOLATED WORKING PARTS — The flexible diaphragm isolates working parts of the valve from the fluid, preventing contamination or corrosion.

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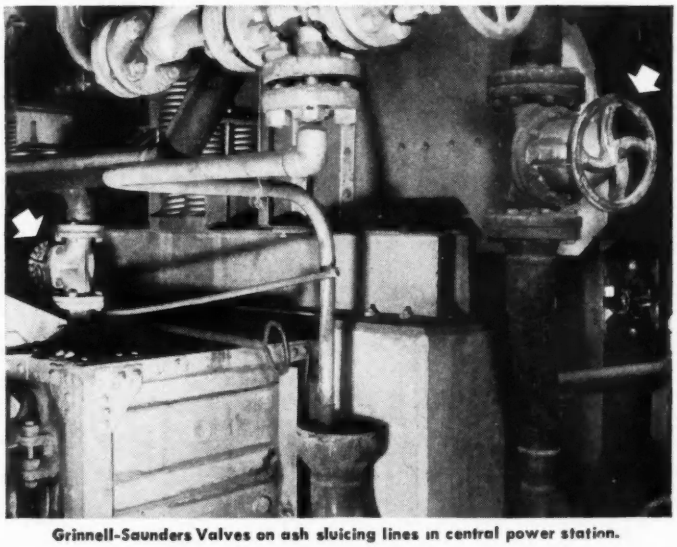

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Equally effective for rayon hosiery and mixtures—woolen and cotton yarns and piece goods—Laurel Triconates, powdered detergents, remove sizing and other foreign matter quickly, safely. Produce clean, soft condition that assures level dyeing—clear shades. For hosiery, can be used in single or split-bath method and in combination with other detergents.

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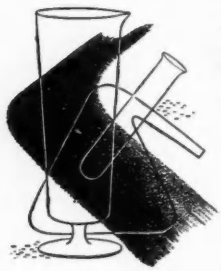

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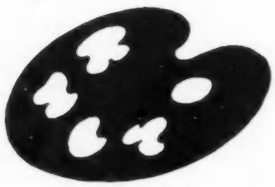

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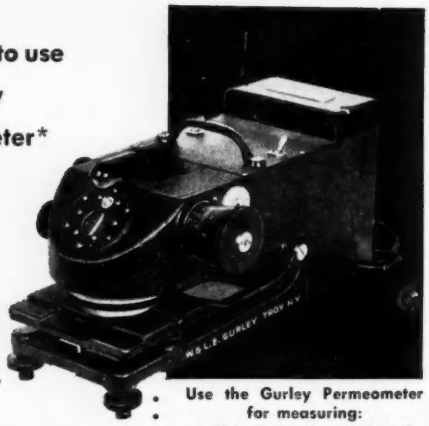

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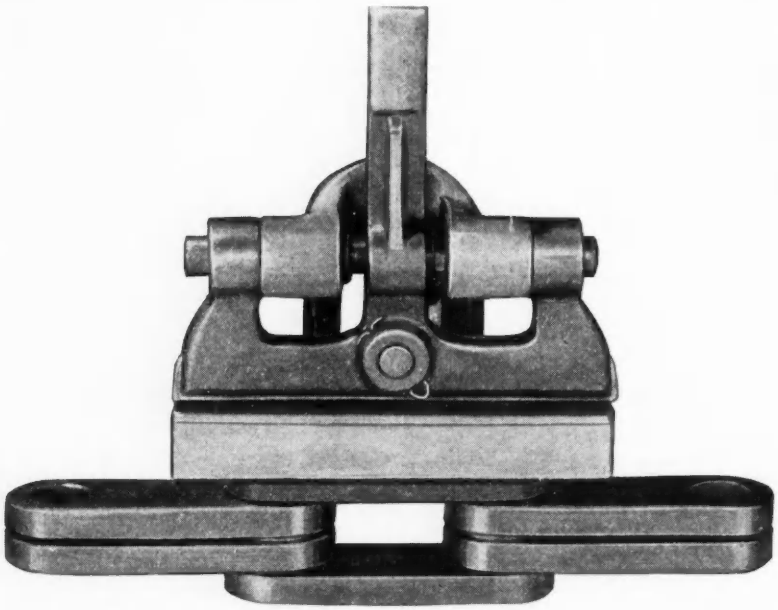

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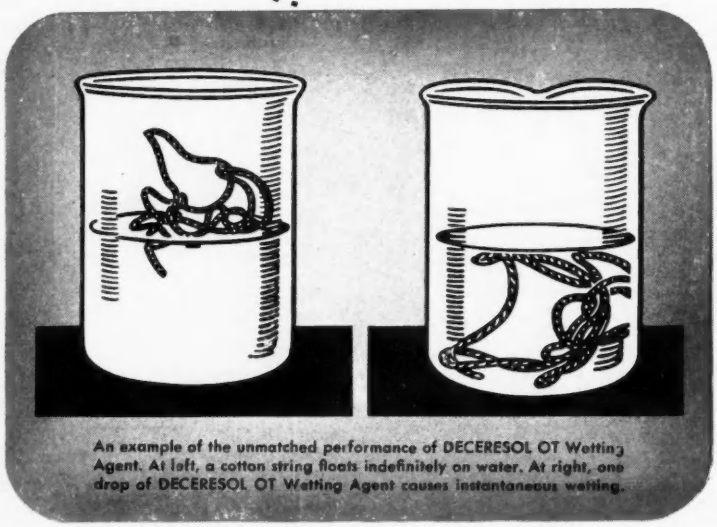

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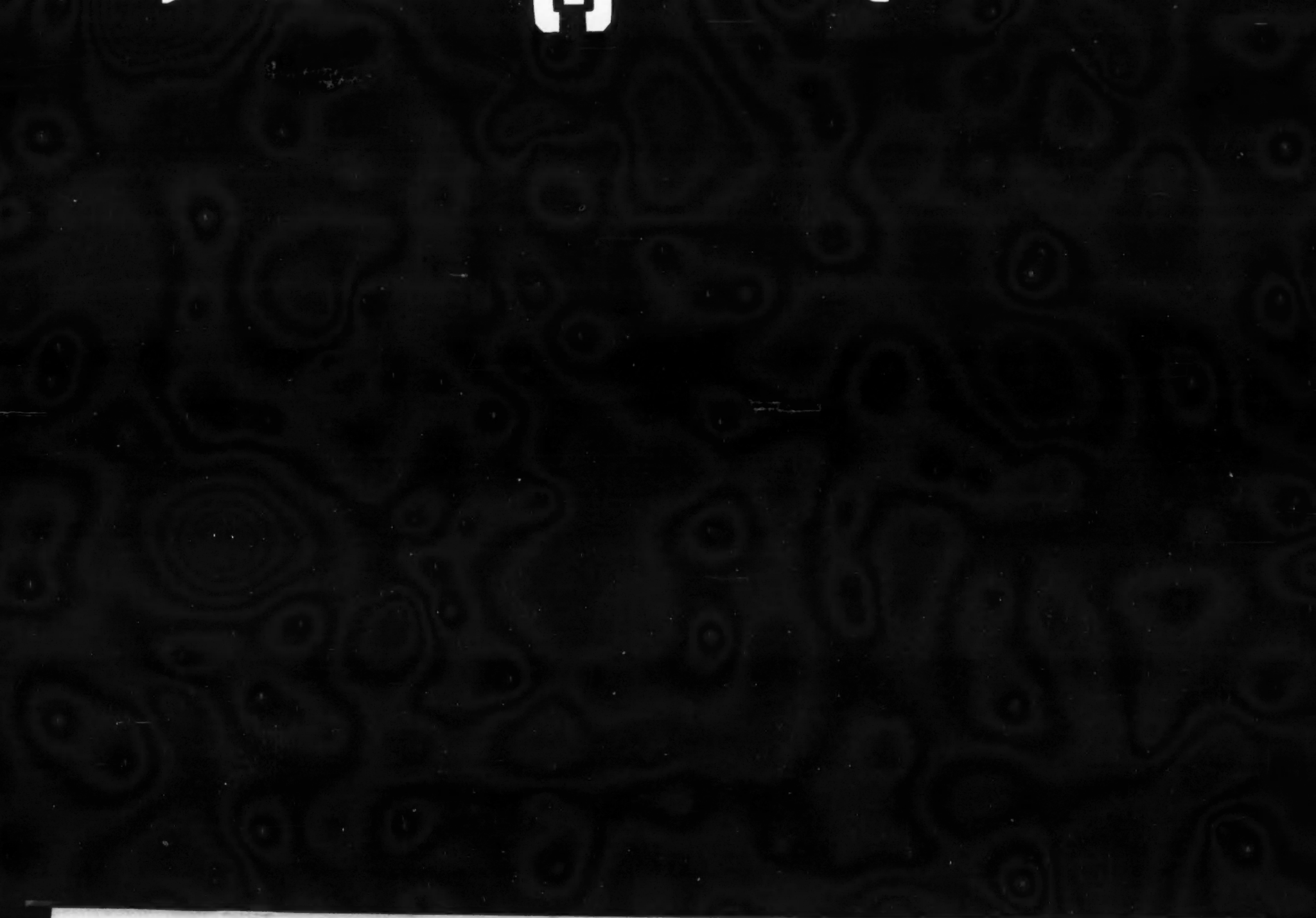
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